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ON

FOREIGN BODIES

IN

THE AIR-PASSAGES.

A

PRACTICAL TREATISE

ON

FOREIGN BODIES

IN

THE AIR-PASSAGES.

BY

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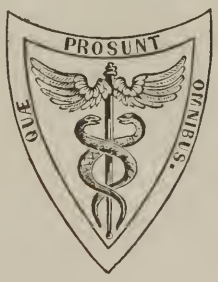
In an inquiry of this kind, in fact, individual experience amounts to nothing; collective experience is everything.—PREFACE.

WITH ILLUSTRATIONS.



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TO

GEORGE W. NORRIS, M. D.,

ONE OF THE SURGEONS OF THE PENNSYLVANIA HOSPITAL, ETC. ETC.,

This Treatise,

DESIGNED AS A CONTRIBUTION TO STATISTICAL SURGERY,

A SUBJECT

WHICH NO ONE UNDERSTANDS BETTER THAN HIMSELF,

BECAUSE

NO ONE HAS STUDIED IT BETTER,

IS CORDIALLY INSCRIBED,

WITH SENTIMENTS OF TRUE RESPECT

FOR HIS

PRIVATE AND PROFESSIONAL CHARACTER,

BY HIS FRIEND,

THE AUTHOR.

"The foundation of all knowledge must be a careful and extensive acquisition of facts; and the first duty of an inquirer, in any department of science, is to bind himself down to such a patient accumulation, bewaring of all premature attempts to combine and generalize them."—Dr. Abercrombie on the Intellectual Powers.

"The high position which medicine has taken, within the last few years, in the hierarchy of the sciences, is almost solely to be attributed to the proper tabulation of the facts of isolated experience, their comparison with each other, and the discussions which have taken place upon them."—Mr. William Coulson.

PREFACE.

THE facts which form the basis of the present volume have been derived, partly from personal observations and partly from the experience of some of my professional friends, but mainly from the various medical journals of the United States, Great Britain, and the Continent of Europe. From systematic works on surgery, with a few rare exceptions, no advantage has been obtained, for the simple reason that the subject of which it treats has not received, from any of them, any adequate share of attention. The number of cases of foreign bodies in the air-passages which now, for the first time, meet the public eye, amounts to nearly fifty.

My first care was to collect these facts together; the second, to analyze and compare them with each other; and the third, to deduce from them such conclusions, general and particular, respecting the nature, symptomatology, pathology, and treatment of foreign bodies in the air-passages as the premises might fairly warrant. The labor which has been thus spent has not been light. I found the whole subject in a state of chaos; no attempt had ever been made, at least in modern times, to systematize it, or to present it in a clear, tangible, and connected form. My design originally was, not to write a book, but to compose a short monograph for some medical journal; but I had not proceeded far before I discovered that I had formed a very imperfect idea of the enterprise, and that, in order to do it anything like justice, it was necessary to devote to it much time and study. The result is now before the profession; and, whatever judgment may be pronounced upon it, I trust that I may be awarded at least some credit for my effort to improve a most interesting, and hitherto a most neglected, department of surgical pathology and practice. If, in the Providence of God, the work shall be instrumental in saving the life of one human

being, or even in ameliorating the suffering of a single individual, I shall feel myself amply remunerated for the time and toil bestowed upon its composition. If there be any situation, better calculated than another, to awaken our sympathy, it is when we see before us a fellow creature who is threatened, every instant, with destruction, in consequence of the lodgement of a foreign body in the air-passages, without the ability to expel it, or the power to inflate his lungs. It was this reflection which first induced me, many years ago, to turn my attention to the subject, and which has finally impelled me to write this treatise.

In arranging and systematizing my materials, I have endeavored to make every case, accessible to me, my own. I have placed myself, as it were, in intimate relation with each patient, and have carefully watched him from the commencement to the termination of his suffering. In this manner I have acquired a thorough knowledge of the nature of his accident, the character of his symptoms, and the effects of the different methods of treatment directed for his relief. I have, as it were, performed each operation, have carefully conducted the after-treatment, and, where the result has been fatal, I have not failed, when opportunity permitted, to inspect the body, in order that I might thus be able more fully to appreciate the various lesions induced by the presence of the extraneous substance. In no other manner could a work upon such a subject have been produced. To have contented myself with my own experience would have been absurd; for, although I have probably seen as many cases of this accident as any other practitioner of my age, yet it would have been of but little avail in the establishment of great principles when compared with the many isolated facts scattered through our periodical literature. No man, however old, or however great his opportunities for observation, can possibly have much experience in this branch of surgery. I am not aware that the writings of Sir Astley Cooper contain a solitary example of this accident, and but few cases are recorded in the works of Desault, Pelletan, and Dupuytren, who held so long the post of Surgeons to the Hôtel-Dieu of Paris. In an inquiry of this kind, in fact, individual experience amounts to nothing; collective experience is everything. Viewed in this light, I can conceive of no labor which is more likely to be of permanent use to the profession than that of arranging, analyzing, and tabulating the isolated and scattered facts of medicine and surgery. It

is in this way, and in this way only, that we can hope to render our periodical literature available to the interests of science and humanity. The high position which certain branches of the healing art have, of late years, attained in the estimation of medical philosophers is justly ascribable to this kind of labor.

No complete and elaborate monograph has ever appeared, in any language, on foreign bodies in the air-passages. The only approach to such an attempt, so far as my information extends, was the "Memoir on Bronchotomy" by Mons. Louis, read before the Royal Academy of Surgery at Paris, in 1759, and published, soon after, in its *Transactions*. In that paper, so celebrated in its day, this distinguished savant collected all the cases of foreign bodies then known to the profession, and pointed out, in the most forcible and eloquent manner, the importance of a more correct diagnosis and the indispensable necessity of an early resort to the knife. Having witnessed, in several of his consultations, the evil effects of delay, and carefully studied the facts with which his industry and learning had supplied him, he wisely imparted his knowledge to his profession, thereby at once enriching its literature, and conferring a real service upon his race. The cases which form the basis of his memoir are twenty-eight in number, and they may be said to comprise everything of value upon the subject up to the time of its publication. It would be difficult to find in the practical writings of that period, a tract evincing a more clear and philosophical spirit, a more nice appreciation of the wants of the age, or a more just and discriminating criticism. It was, in short, in every respect, worthy of the name and fame of the illustrious Secretary of the French Academy of Surgery.

In Great Britain, several papers have appeared upon this subject, among others, one by Mr. Henry Earle, of London; but none of any real value, learning, or importance. In 1822, Dr. H. G. Jameson, of Baltimore, read a short memoir on foreign bodies in the air-passages, before the Medical Society of Maryland, which was soon after published in the *American Medical Recorder*, and which constituted, for a long time, one of the best accounts of the kind in the English language. In 1799, Dr. John Gottlob Eckoldt, of Leipzic, published a small tract on foreign bodies in the œsophagus, in which he incidentally discusses the subject of extraneous substances in the windpipe. A few years ago, M. Jobert inserted a Memoir on Foreign Bodies in the Air-passages in *L'Union Médicale*,

a French periodical, which, however, has not met my eye, except in the form of a brief outline in one of our journals. This sketch of the literature of foreign bodies does not, of course, embrace the numerous cases that have been reported, from time to time, by the medical press of this and other countries. An abstract of these cases, upwards of two hundred in number, accompanies the present work, and forms one of its most important elements.

In the prosecution of my labors I have found it necessary frequently to adduce the same cases in illustration of different topics. This circumstance will serve to explain what might, otherwise, appear to some as useless and unnecessary repetitions. It is also proper to state that, in abridging and arranging the selected cases, I have not hesitated, wherever occasion seemed to require it, to avail myself, to some extent, of the language of the reporter. Such a course, which has been sanctioned by the highest authorities in this country and Great Britain, as Beck, Lawrence, and Mackenzie, was essential, in many instances, to a correct presentation of the meaning of the writer.

Finally, it is with great pleasure that I acknowledge my obligations, for favors received during the progress of the work, to Dr. J. M. Warren, of Boston, Dr. John L. Atlee, of Pennsylvania, Professor Hamilton, of Buffalo, Dr. James D. Maxwell, of Indiana, Professor Van Buren and Professor E. H. Davis, of New York, Dr. E. Williams, of Cincinnati, Dr. Penrose and Dr. Pepper, of Philadelphia, Dr. Kimball, of Massachusetts, and my colleague, Professor Austin Flint, of the University of Louisville. I take great pleasure, also, in acknowledging my indebtedness to my learned and distinguished friend Dr. Condie, of Philadelphia, for his kindness in superintending the proofs in their passage through the press; a task involving great labor, and, I doubt not, much vexation.

S. D. GROSS.

Louisville, November, 1854.

*** Through inadvertence of the press, a case, mentioned at page 118, and communicated to me by a gentleman of this city, is credited to the London Lancet for 1839–40.

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ON

FOREIGN BODIES

IN THE AIR-PASSAGES.

CHAPTER I.

As preliminary to the study of the symptomatology, diagnosis, pathology, and treatment of foreign bodies in the air-passages, it is proper that we should make some remarks upon the nature of these substances; we may next consider the changes which they are liable to undergo in consequence of their retention; in the third place, we shall point out their more common situations; and, lastly, we shall describe the route by which they usually enter and by which they are expelled. These topics involve considerations of great practical importance, and, therefore, require separate discussion.

SECTION I.

NATURE OF FOREIGN BODIES.

There is hardly any substance, however singular or *outré*, that may not enter the air-tubes, and give rise to severe, if not fatal mischief. This is true alike of the vegetable, animal, and mineral kingdom. The following catalogue, which I have been at much pains to collect, although, perhaps, not complete, comprises the most common and important of the bodies that have yet been found in these situations. A single glance will serve to show their exceedingly diversified character.

These substances may be appropriately arranged into different classes, according to the nature of their composition; as the vegetable, animal, mineral, and mixed. The first comprises beans, of almost every description; grains of corn; melon-seeds; pumpkin-seeds; peas; cherry-stones; acorns; prune-stones; chestnuts; filberts; tamarind-stones; apple-seeds; orange-seeds; raisin-seeds; apricot-stones; persimmon-stones; almond-shells; beech-nuts; cotton-seeds; pills; bread; carrot; cabbage; ginger; mushrooms; walnut-shells; sweet and Irish potato; potato-skin; wood; bark; cedar; spikes of oat; nutmegs; sealing-wax; linen; beech-nut burs; ears of grass, rye, and barley; cockle-burs; gum elastic; butternut-shells; pipe-stems; wooden stopper of an inkstand; berry of the bladder-senna; pea-nut shells; charcoal; fiddle-peg; threads; locks of tow; leaves, and other substances.

The second class includes animal substances; as bits of hard-boiled egg, beef, veal, cartilage, tendon, and bone; clots of blood; flies; millepeds; leeches; worms; fish; lobster-claws; mussel-shell; cowry-shell; quills; button-foils; worsted yarn; locks of wool; cloth; and teeth—natural and artificial—human and animal.

Under the third head are comprised mineral substances, the number of which is quite considerable; as buttons; button-moulds; pins; needles; shot; bullets; marbles; different kinds of coin, as a six-pence, half sovereign, and sous; pebbles; slate-pencils; glass; delft; carpet tacks; brass nails; horseshoe nails; glass beads; pipe-stems; dress-hooks; ring of a watch-chain; silver tube; screw nails; and porcelain teeth.

The fourth class includes substances of a mixed character, or such as are partly vegetable and partly animal, partly animal and partly mineral, or partly mineral and partly vegetable. As examples of this variety may be mentioned lead-pencils, artificial teeth, with their blocks and pivots, and the remarkable instance of a puff-dart, as it is called, observed by Mr. R. S. Nunn, of England, and which will be more fully noticed hereafter.

Dr. Mott,[1] some years ago, met with an instance in which a child, eleven months old, inhaled a large, black shawl-pin, two inches in length, with a head nearly as large as a small marble. A case occurred in New Hampshire,[2] in 1850, in which a man lost his life

[1] Cooper's Surgical Dictionary, Appendix by Dr. Reese, art. Tracheotomy.

[2] New Hampshire Journal of Medicine, April, 1852, p. 197.

by the intromission into the trachea of a piece of sponge, used for wiping the nasal passages; and, as if to cap the climax, and throw into the shade all other examples, an instance recently happened at Kœnigsburg, Germany, in which the larynx of a goose was impacted in the larynx of a boy, twelve years of age.[1] This case is so remarkable that, were it not well authenticated, it would appear almost incredible; that it did take place, however, is indisputable. Pelletan[2] gives the case of a child, two years old, who inhaled a piece of the jaw-bone of a mackerel. Dr. Lacretelle[3] saw a soldier who perished from the presence of a leech in the ventricle of the larynx; the accident happened in drinking water from a pool, and death occurred before an operation could be performed. Mr. Nunn,[4] of England, in 1845, met with an instance in which a man inspired a "puff-dart," a projectile, formed of a nail, wrapped at one end with worsted, and used for blowing through a tube. Mons. Augustus Bérard,[5] of Paris, some years ago performed tracheotomy on a child, between six and seven years old, for the removal of a marble, eight lines in diameter; it was supposed to have been arrested in the larynx, and was forcibly ejected the moment the opening was completed; the patient recovered perfectly. Gautier[6] relates the case of a man who inadvertently inhaled a small fish which he happened to have in his mouth. The late Professor Colles,[7] of Dublin, attended a child who had drawn a popgun, made of a piece of quill, charged with a bit of raw potato, into his windpipe. Dr. J. W. Heustis,[8] of Alabama, gives the particulars of a case of a little girl, who, after having been harassed for several months by a most distressing cough and difficulty of breathing, one night ejected a piece of feather, nearly two inches in length, and still furnished with some of its plumage. Professor Watson, of Nashville, had a case in which an individual inhaled the ferule of the rib of an umbrella, containing a piece of whalebone.[9]

Many years ago the following interesting case, communicated to

[1] London Medical Gazette, vol. xi. p. 559, 1850.
[2] Clinique Chirurgicale, tom. i. p. 6, Paris, 1810.
[3] London Lancet for 1828, vol. ii. p. 104.
[4] Provincial Med. and Surg. Journ. July 25, 1849.
[5] Archives Gén. de Médecine, 2d series, tom. ii. p. 125, 1833.
[6] Journal de Médecine, Chirurgie, &c. Mai—Août, 1785, tom. lxiv.
[7] Lectures on Surgery, by McCoy, p. 104; Philadelphia edition, 1845.
[8] New York Medical and Physical Journal, vol. v. p. 560.
[9] Professor Eve, Nashville Journal of Med. and Surg. vol. v. p. 140, 1853.

me by a very intelligent friend in this city, occurred in Boston. A boy, while at school, was chewing a long thin piece of gum elastic, and accidentally swallowed it. He was immediately seized with violent dyspnœa and convulsions, and expired in two hours afterwards. An examination being made, the foreign body was found in the inferior portion of the trachea, coiled up in such a manner as to prevent respiration.

It appears strange that a substance so large and rough as an ear of rye, wheat, or barley, should be able to enter the larynx; and yet several examples of this description have found their way into our literature. One of the most interesting is mentioned by Dr. Watson, in his *Lectures on the Principles and Practice of Medicine*, as having fallen under the observation of the late Mr. Herbert Mayo, of London, who furnished him with a history of it.[1] The son of an English nobleman, aged twelve years, while riding in the neighborhood of Paris, happened to have an ear of rye in his mouth. The carriage made a sudden jolt, and in an instant the rye had disappeared. Little was thought of the occurrence at the moment; but sometime after symptoms of pulmonary irritation set in, attended with hectic fever, and with the most fetid expectoration. The boy gradually sunk. On dissection, the ear of rye was found in an abscess which was common to the right lung and to the liver, the latter of which had become involved by an extension of the morbid action across the diaphragm. In another case, alluded to by the same distinguished writer,[2] a lady, the sister of a French physician, inhaled an ear of barley, which she ejected spontaneously seven years afterwards. During that long period she had experienced repeated attacks of copious hæmoptysis. Her recovery was perfect. Dr. Stanski[3] gives an instance in which a female, aged twenty, drew into her windpipe a spike of wild oats, three inches in length, which was finally discharged through an abscess in the right side, not, however, without causing her death.

Worms, especially the lumbricoid variety, occasionally creep into the windpipe, where they promptly suffocate the patient. Instances of this description are narrated both by ancient[4] and modern ob-

[1] Mayo's Outlines of Pathology, p. 506; London, 1836.

[2] Lectures on the Principles and Practice of Medicine, p. 667, Condie's edition, Philadelphia, 1845.

[3] Gazette Médicale, Juillet, 1837.

[4] Consentini Progymn. Phys. p. 190; Sennerti Prax. Medic. lib. i. p. 133.

servers. The probability is that the occurrence is more frequent in the inferior animals than in the human subject. Mr. Youatt[1] gives an interesting case in which a dog, previously in good health, suddenly lost his life, in consequence of several worms, inhabiting the nose, descending into the windpipe. One of them, about an inch and a half in length, had partly penetrated the rima of the glottis; another, about the same size, was lodged in the left bronchia; and a third, smaller than the other two, was found in the trachea.

Of the above substances those which most commonly enter the air-passages are grains of corn, beans, melon-seeds, pebbles, cherry-stones, and bits of meat, bone, or gristle. In the West, the first of these bodies are, perhaps, oftener found in the windpipe than any other; melon-seeds and beans, especially the former, are also not unusual; while cherry-stones, owing to the scarcity of this fruit in this section of the United States, are seldom met with. In France, Germany, and England, the most common foreign bodies appear to be beans. In the latter country, pebbles and bits of bone, meat, and gristle, are also not infrequently found in the windpipe, as may be seen by a reference to the cases which accompany this treatise. Pieces of coin, pins, buttons, and similar articles, in consequence of the foolish habit, so common in almost every part of the civilized world, of holding such substances in the mouth, are often entrapped in the air-tubes. Within the last twenty years quite a number of cases have been communicated to me where the foreign body was a cockle-bur. Such an example, of which special mention will be made elsewhere, fell under my own observation in 1842, in a gentleman in this State.

Two, three, and even four foreign substances occasionally enter the air-tubes, either simultaneously or successively. This circumstance happened in one of my own cases, mentioned under the head of spontaneous expulsion. The patient was a child, aged seven years, who inhaled, first, a sprig of cedar, and, about five weeks afterwards, a piece of sewing-silk; which were ejected at separate intervals. In an instance, observed by Professor Van Buren,[2] of New York, a child, three years old, expelled, a few minutes after the trachea was opened, a water-melon seed, and the shank of a

[1] The Dog, by William Youatt, p. 336, Philadelphia, 1847.

[2] Transactions of the New York Academy of Medicine, vol. i. part 1, 1851.

plum-stem. Dr. Enos Barnes,[1] of Yates County, New York, gives the case of an infant, aged seventeen months, who inhaled, probably simultaneously, a small pebble and some fragments of beans. Tracheotomy being performed, the pebble was ejected immediately, but the other substances did not make their appearance until the next day. The late Dr. Drake,[2] of Cincinnati, mentions the case of a child, six years old, on whom Dr. Mount, of Ohio, performed laryngo-tracheotomy at the end of five weeks, and who expelled four fragments of a grain of unburnt coffee, three at once, and another and larger one the next day. The child had been eating coffee, and had probably several pieces in her mouth at the time of the accident. Dr. J. Mason Warren, of Boston, informs me that he laryngotomized a child, four years old, who immediately ejected the skin and kernel of a nut, and several weeks after, but not until the wound had closed, a small piece of nut. Professor E. H. Davis, of New York, has communicated to me the particulars of a case in which he opened the trachea on account of the presence of two citron-melon seeds, one of which was expelled immediately after the operation, and the other some days after. But the most remarkable example of the multiplicity of foreign bodies of which I have any knowledge has been recently reported to me by Dr. Sipe, a graduate of the University of Louisville. It happened in a child only eighteen months old. He was called to the case at the end of the sixth day after the occurrence of the accident; and the next morning, finding the symptoms very urgent, he performed laryngotomy. Six fragments of parched corn, one nearly the size of half a grain, were ejected immediately after the operation, and the same number during the course of the same day and evening. The little patient rapidly recovered after this happy riddance.

SECTION II.

ALTERATIONS OF FOREIGN BODIES.

When the foreign body is of a vegetable or animal nature, as a pea or bit of meat, it is liable to imbibe some of the moisture of the surface with which it lies in contact, and may thus increase in

[1] New York Med. and Phys. Journ. vol. vi. p. 78.

[2] Western Journal of Medical and Physical Sciences, vol. xi. p. 341, 1837.

volume. The heat of the part no doubt also contributes to the same result. The fact that such a change may be produced is of great interest in a practical point of view, and deserves the serious attention of the surgeon.

The degree of expansion which may be produced under the joint influence of the two causes above mentioned, varies so much, in different cases and in different circumstances, as to admit of no precise statement. Beans, peas, and grains of corn, seem to be particularly prone to increase in bulk from these causes; sometimes a great deal even in a very short time. In an instance narrated by M. D'Arcy, the extraneous substance, a bean, swelled to treble its natural dimensions in the space of a few days.[1] Dr. J. Mason Warren, of Boston,[2] has published the particulars of the case of a girl, aged eight years, in which a similar body attained more than double its normal bulk in a still shorter period. It was two-thirds of an inch in length, and half an inch in breadth. Dr. Davidson, of Madison, Indiana, removed from the air-passages of a child, four years old, a grain of maize, which, on the third day after the accident, already exhibited signs of germination.[3] A similar example has been communicated to me by my friend Dr. John Shackleford, a distinguished practitioner of Maysville, Kentucky. The patient, a negro boy, aged six years, died ten days after the operation of laryngotomy, performed soon after the occurrence of the accident, and the grain of corn was found in the larynx in a very swollen and sprouting condition. Dupuytren operated upon a little girl, aged eight years, nearly forty-eight hours after the accident, and extracted a large bean, rendered unnaturally prominent by the tumefaction of its cotyledons.[4] On another occasion he found the foreign body, also a bean, considerably enlarged by the end of the fifth day.[5]

When the foreign body is long retained it not unfrequently becomes incrusted with various kinds of matter. Such an occurrence is more apt to take place when the substance is lodged in the bronchial tubes than when it is situated in the larynx or trachea. The investing matter may be merely inspissated mucus, or it may consist partly of mucus and partly of lymph, of lymph alone, or

[1] Velpeau's Operative Surgery, vol. iii. p. 467, Amer. ed.

[2] Boston Med. and Surg. Journ. vol. xxxvii. p. 391, 1848.

[3] Western Lancet, for May, 1848; also, Am. Journ. of Med. Sci. N. S. vol. xvi. p. 263.

[4] Leçons Orales, tom. iii. p. 589, Paris, 1833.

[5] *Op. cit.* tom. iii. p. 597.

of earthy substance, principally carbonate and phosphate of lime, cemented by a little animal matter. The quantity of earthy substance rarely exceeds a few grains; but in the case of the old monk, mentioned in the *Ephemerides of Natural Curiosities*,[1] it formed a concretion as large as a nutmeg. It is generally arranged amorphously, but occasionally it exists in distinct lamellæ.

It is interesting to know that a substance even as hard as ginger may, by contact with the secretions of the bronchial tubes, become swollen and softened. An instance illustrative of this fact is mentioned by Mr. James Sheppard, of England, in the *London Lancet*.[2] The patient was an old man of seventy-three, who died from the effects of the accident in forty-one hours after its occurrence. The examination was made two days after, when the piece of ginger, lodged in the right bronchial tube, was found to be soft, swollen, and impregnated with bloody mucus; it was an inch and a quarter in length, and half an inch in breadth at its widest part. Melon, orange, apple, pear, and quince seeds, from the character of their envelop, resist the softening process almost entirely, and hence they rarely undergo any change in their bulk, however long they may be retained in the windpipe. Cartilage and tendon, apple, cabbage, turnip, carrot, and similar vegetable substances are incapable of expanding under the influence of the heat and moisture of the air-tubes. The same is true of hard-boiled egg, beef, mutton, and, indeed, of roasted meats generally.

Very absurd notions appear to be entertained by some practitioners respecting the softening power of the air-passages in this accident. They really seem to imagine that any substance, however hard, may undergo this process. Thus, in the case of a child who had inhaled a persimmon-seed, the reporter remarks[3] that the foreign body, not being easily affected by heat and moisture, had not enlarged so much as to produce dyspnœa. A few years ago, a case occurred in London, under the care of Mr. J. G. Forbes,[4] where the question of operation was mooted, but decided against, on the ground, among others, that if the offending substance was a piece of gristle, it might be softened and coughed up. Such notions, for they are nothing else, might be dismissed with a smile, if it were

[1] Decad. ii. an. x. obs. lxvi. p. 123.

[2] Boston Medical and Surgical Journal, vol. xxxiii. p. 95.

[3] Dr. S. Annan, American Medical Recorder, vol vii. p. 47, 1824.

[4] London Medico-Chirurg. Trans. vol. xxxiii. p. 9, 1850.

not for the mischievous tendency which they are calculated to produce in the minds of the thoughtless and unwary. We might as well wait for the softening and disintegration of the Rock of Gibraltar by the waters of the Atlantic and Mediterranean, as for the softening and disintegration of a persimmon-stone and a piece of gristle by the heat and moisture of the air-passages.

In the case of Mr. Forbes,[1] just alluded to, the operation was fatally delayed, not only because it was supposed that the foreign body, if a piece of gristle, might be softened and coughed up, but because it was inferred that it would necessarily give rise to less irritation than bone. The patient, a woman aged 46, lived nearly two months after the accident; and, on dissection, the foreign body, which proved to be a small piece of bone, was discovered in the third branch of the bronchia. In such a case, it is pretty evident that no operation, however early employed, would have been of any benefit. I mention the circumstance merely to show the absurdity of trusting to so remote a contingency as the softening and solution of a piece of cartilage impacted in the air-passages.

It is probable that the particular situation of the foreign body has some influence upon the change of bulk and consistence wrought upon it during its sojourn in the windpipe. A substance impacted in one of the bronchial tubes would be likely, I think, to experience this change in a greater degree, as well as more rapidly, than one lodged in the trachea, or larynx. The extent of contact should also be taken into account; and, finally, the character and quantity of the secretion excited by the presence of the extraneous body.

The softening process is sometimes carried so far as to break down the foreign substance, or to convert it into fragments, which are afterwards ejected separately, or en masse. The celebrated case of Marcellus Donatus offers an interesting illustration of the truth of this fact.[2] In this case a lady accidentally dropped a pill into her windpipe, where for three hours it occasioned the most alarming symptoms of suffocation. The pill at length dissolved, and was coughed up, little by little, with the expectorated matter. In a case, the particulars of which are briefly detailed in the *American Journal of the Medical Sciences*,[3] from a French periodical, a bean, in-

[1] Medico-Chir. Trans. of London, vol. xxxiii. p. 1, London, 1850.

[2] Louis, Memoir on Bronchotomy, in Mem. de l'Academie de Royale de Chir. tom. iv. p. 477. Paris, 1819.

[3] Vol. i. p. 231, N. S.; Archives Générales de Médecine, 3d ser. tom. vii. p. 369, 1840.

haled by a young child forty days previously, was, at the end of this time, coughed up in fragments, followed by complete recovery.

The following interesting case, bearing upon this subject, was recently communicated to me by my friend Dr. James D. Maxwell, of Bloomington, Indiana: A girl, aged nearly four years and a half, in February, 1853, received a hurt while she was holding a grain of corn in her mouth. In the act of crying, the grain was drawn into the windpipe, where it produced frequent paroxysms of coughing, which were very severe for the first twelve hours, and were accompanied by a disposition to swoon. She took hardly any food for eight days, and became very much emaciated. At the end of this time she began to eat more, and to regain her flesh and strength. Four months and a half after the accident, while somewhat worried with her play, she commenced coughing, and threw up, not the entire grain of corn, but the entire and unbroken husk, the internal and hard portion having, no doubt, become disorganized, and been discharged piecemeal in the efforts at coughing.

Again, a foreign substance may, at the moment of its entrance, be partially broken, and, during its sojourn in the air-passages, the fragments may be detached from each other, and be afterwards ejected separately. This circumstance probably occurred in the instance, observed by Dr. D. M. Reese,[1] of New York, of a child, aged nine years, who inhaled a tamarind-seed, which came very near causing death by suffocation. The trachea being opened, the extraneous substance did not show itself, although the most satisfactory relief ensued. An obstinate cough and irritative fever continued for several days, when a small portion of the seed was expectorated; but the main body of the tamarind was not ejected until three weeks after the operation.

SECTION III.

SITUATION OF FOREIGN BODIES.

The foreign body may be arrested in different portions of the windpipe, or it may remain loose, and move up and down the canal during the expulsion and introduction of the air. Occasionally, it

[1] Cooper's Surgical Dictionary, Supplement, New York, 1842.

is stopped at the very entrance of the larynx; but more frequently, by far, it passes into the interior of this tube, and lodges in one of its ventricles. How many persons have perished, perhaps in an instant, and in the midst of a hearty laugh, the recital of an amusing anecdote, or the utterance of a funny joke, from the interception at the glottis of a piece of meat, a crumb of bread, a morsel of cheese, or a bit of potato, without a suspicion, on the part of those around, of the real nature of the case! Many a coroner's inquest has been held upon the bodies of the victims of such accidents, and a verdict rendered that they died by the visitation of God, when the actual cause of death lay quietly and unobserved at the door of the windpipe of the deceased.[1]

When the extraneous body enters the larynx, it is generally either arrested in the interior of that canal, or it descends into the trachea, or it falls down into one of the bronchial tubes, more commonly the right. Its disposition in any position of the windpipe will be influenced, very materially, by its size, form, and weight. A small and smooth body will, in general, be much more likely to pass beyond the larynx than one that is large and rough; the same is true of a heavy substance, as a bullet, as compared with one that is light, as, for example, a piece of potato-skin, a pea-nut shell, or a feather. To this rule, however, as observation shows, many exceptions occur. What, for instance, can be more rough than a cockle-bur, or larger, relatively to the canal which it often traverses, than a French bean, a grain of maize, a pebble, or a plum-stone; and yet these substances have found their way, again and again, into the trachea and bronchial tubes. Looking at the dimensions of the glottis, and at the peculiar slit-like form of this aperture, we

[1] In a case reported by Dr. Seely Brownell, of Bath, New York, a foreign body in the windpipe became the subject of a coroner's inquest, on the ground that the patient, a child, about five years old, had been foully dealt with by those who had charge of it. It appears that about 9 o'clock in the morning, while amusing itself with some garden-beans, it became suddenly choked, but soon recovered so as to be able to resume its play. It remained well until about noon, when the symptoms recurred with great severity, though they did not last long. It became again playful, and even took some food, but complained a little now and then of a feeling of suffocation. At 4 o'clock in the afternoon it was again attacked with spasmodic breathing, attended with violent struggles, and expired in a few minutes. On dissection, a bean was found in the trachea, about one inch above its bifurcation, so large as completely to fill its caliber. The mucous membrane of the tube was slightly inflamed and tumefied. (*Boston Med. and Surg. Journal,* vol. xxxviii. p. 333, 1848.)

are struck with amazement at the immense size of the bodies which it is capable of admitting during the act of inspiration; bodies which the best directed and the most protracted efforts of nature are incompetent to expel; bodies, which, in a word, can be removed, in many instances, only by a free incision into the windpipe.

When the extraneous substance is arrested in the *larynx*, it may lodge in one of its ventricles, usually denominated the ventricles of Morgagni, or it may become fixed between the vocal chords. Occasionally, though rarely, it is stopped in the inferior portion of the tube, or partly in the larynx and partly in the trachea. Small as the ventricles of Morgagni are, even in the adult, they often intercept bodies of comparatively large bulk; and not a few instances are recorded where substances, of various dimensions, configuration, and composition, were retained in their interior for months and even years with little inconvenience and suffering.

The foreign body, after having been retained for some time in the larynx, becomes occasionally encysted, or surrounded with lymph. The occurrence is, of course, very infrequent, but it has been observed in at least one instance, and is therefore worthy of recollection. The case alluded to happened in the practice of Mr. Bullock, of England, by whom it has been reported in the eighteenth volume of the *London Medical Gazette*. The foreign body, a quartz pebble, was found, on dissection, lying at the junction of the larynx and trachea, where it was confined by a tolerably thick layer of apparently organized lymph. The mucous membrane beneath the pebble was ulcerated, and the corresponding portion of the canal nearly closed.

The foreign substance is not often arrested in the *trachea*, or, if arrested, it does not long remain in it. Instead of this, after having passed the larynx, it generally, either at once, or at a very early period, descends into one of the bronchial tubes, from which, however, during a violent expiratory effort, it may be again impelled upwards, not only into the trachea, but even into the larynx. A needle, pin, bit of bone, or, in short, any sharp and slender body, might be permanently retained in the trachea, in consequence of its extremities becoming implanted in its walls; so also might a cocklebur, a piece of meat, a lump of cheese, or a piece of sponge, as in the case of Dobie, already alluded to. Mr. Phillips,[1] of Lon-

[1] Sir B. C. Brodie, Medico-Chir. Trans. of London, vol. xxvi. p. 293, 1843.

don, met with an instance in a little girl, two years old, who lost her life from having inhaled a portion of the claw of a lobster, which was firmly fixed in the trachea, a little above the level of the upper bone of the sternum. A solid or heavy body, as a bullet, pebble, shot, or grain of corn, will, on the contrary, all other things being equal, be almost certain to pass into the bronchial tubes, in obedience simply to the laws of gravity. No contraction of the trachea, however strong or energetic, would be likely to retain it in that canal beyond a few seconds; the moment the spasm relaxes it would lose its hold, and the body would sink, by the force of its own weight, into the passage below. If a bean, pebble, or other similar substance has occasionally been found in the trachea after death, or during the operation of tracheotomy, such an event is to be regarded rather as an accidental than an ordinary occurrence. In either case, it is not, as a general rule, arrested there, but simply impelled there by the expulsive efforts of the lungs.

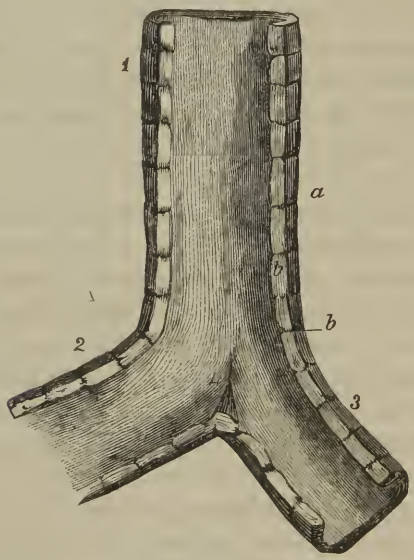
The disposition of the foreign substance in the *bronchial tubes* varies according to a number of circumstances, of which the principal are the relative capacity of these tubes, or, rather, the situation and arrangement of the septum by which they are united to each other, and the configuration, volume, and weight of the intruding body.

It seems to be well ascertained that foreign bodies, upon arriving at the inferior extremity of the trachea, have a much greater tendency to pass into the right bronchial tube than into the left. That an occurrence so frequent and so remarkable should have given rise to various conjectures as to its nature, is what might reasonably have been expected, and yet it is not a little extraordinary that, amidst so much investigation and speculation, the true cause of it should have remained so long concealed. The tendency in question was supposed by almost every one, until recently, to be owing to the difference in the diameter, length, and direction of the two tubes. As the right is shorter, wider, and more horizontal than the left, it was, perhaps, natural enough to conclude that it was particularly favorable to the entanglement of foreign substances. But there was, unfortunately, one great defect in this theory, the fact, namely, that it omitted to take cognizance of the circumstance that a foreign body, descending the trachea by virtue of the laws of gravity, would be more likely to seek an oblique than a horizontal passage. If this be true, and it can hardly be otherwise, it is obvious that the

left and not the right bronchial tube is the one into which the offending substance ought generally to fall. This, however, as has been already seen, is not the case. Some, again, have imagined that this tendency is attributable to the greater capacity of the right lung, in consequence of which the air habitually enters the corresponding canal with proportionably greater force and velocity, thereby impelling the intruder in the same direction. Finally, a third class of writers have endeavored to account for it by the circumstance of the right tube forming a more obtuse angle with the trachea than its fellow of the opposite side.

The above explanations are certainly ingenious, but they all labor under the disadvantage of being insufficient for the purposes for which they have been invented. The true cause, undoubtedly, is the peculiar position and arrangement of the *septum* (Fig. 1) at

Fig. 1.



BRONCHIAL SEPTUM.

Trachea and bronchial tubes, laid open in front. 1. Trachea. 2. Right bronchial tube. 3. Left bronchial tube. 4. Bronchial septum, somewhat magnified, to render it more conspicuous.

the root of the trachea, indicating the line of junction of the two bronchial tubes. This septum, spur, or ridge, to which, from its situation, the term bronchial may be appropriately applied, is not,

as will be seen hereafter, in the mesian plane, but decidedly to the left of it, as may be shown by a perpendicular line extending from the centre of the rima of the glottis to the corresponding point of the inferior extremity of the windpipe, properly so called. Hence a body, especially one of considerable bulk, after having passed the larynx, will be very likely, by striking this septum, as it will be apt to do in its descent, to be pushed over towards the right side, its entrance into the corresponding tube being still further favored by the greater diameter of this tube. The probability, indeed, is that both these circumstances co-operate in promoting this result, so interesting and important both in a diagnostic and practical point of view. Mr. Goodall, of Dublin, appears to be entitled to the credit of having first called the attention of the profession to the part played by this septum in directing the passage of foreign substances in their descent towards the lungs. The observation is unquestionably one of great value.[1]

Sometimes each bronchial tube contains a foreign body simultaneously, as in the interesting instance observed by Professor Mott. In this case, which proved fatal after tracheotomy had been performed, a piece of the kernel of a walnut was found impacted in each canal.[2]

Occasionally, again, the foreign body descends beyond the bronchial tubes, into one of their principal divisions. Thus, in a case observed by Dr. J. G. Forbes,[3] of London, it was lodged in the orifice of the third branch of the canal communicating with the middle lobe of the right lung. Such an occurrence is, of course, very rare, and can happen only when the substance is unusually small, as in the present instance.

When a foreign body is retained permanently, or for any considerable period, it either becomes encysted, and is thus rendered comparatively innocuous; or, as more generally happens, it sets up irritation in the circumjacent parts, which in one case, perhaps, prepares the way for its own expulsion, while in another it may produce such ravages as to destroy the patient. The structural changes liable to be induced by its presence, will claim due consideration under the head of pathological effects, in another part of this volume.

[1] Stokes's Treatise on the Diseases of the Chest, p. 239, Philadelphia, 1844.

[2] Cooper's Surgical Dictionary, Reese's Appendix, art. Tracheotomy.

[3] Medico-Chirurgical Transactions of London, vol. xxxiii. p. 14, 1850.

It has been stated by Dr. John Browne,[1] of Dublin, that the impaction of foreign bodies in the bronchial tubes is of less frequent occurrence in children than in adults; and he appears to think it fortunate that it should be so, as the narrowness of the glottis, the smaller size of the trachea, and the greater sensibility of the organs generally in young subjects render such accidents peculiarly severe. It is to be regretted that this gentleman has not furnished us with his reasons for this opinion, for which, I think, there is certainly not the slightest foundation in truth. So far from this being the case, I should suppose that just the reverse would usually obtain. I am not aware that children generally inhale smaller bodies, absolutely speaking, than adults; and if this is really the fact, and there can be no doubt of it, we may legitimately infer that the impaction of these substances will be much more likely to take place in young than in old subjects, because of the greater size of the caliber of the respiratory passages in the latter than in the former. Let us, for example, take a bean, half an inch long by the third of an inch in diameter; such a body would readily pass the glottis, and descend into one of the bronchial tubes, where, from its large bulk, it would almost inevitably become fixed. In the bronchia of an adult, on the other hand, it would be comparatively small, and, therefore, have a tendency to remain loose, if not to play up and down the windpipe.

I am not aware that the statement of Dr. Browne has been corroborated by other observers, and I have alluded to it here merely because of its practical bearing. The impaction of a foreign substance in the air-passages is at all times a most serious occurrence, and nowhere certainly is it more so than in the bronchial tubes, where it is always extremely difficult to reach and seize any body, whatever may be its volume or form, with any instrument, however carefully constructed, or however dexterously managed.

The question as to the *relative frequency* of the situation of foreign bodies in different portions of the air-passages is one of great practical moment, and it is not surprising, therefore, that it should often be a source of anxious inquiry. Desirous of throwing as much light upon this subject as my limited opportunities will admit of, I have taken special pains to examine the numerous cases analyzed in this report, and the following are the results:—

[1] Edinb. Med. and Surg. Journal, vol. xxxv. p. 286.

The number of cases of death, without operation and without expulsion of the offending body, is twenty-one. In these the substance was situated, in eleven, in the right bronchial tube; in four, in the larynx; in three, in the trachea; in one, partly in the trachea and partly in the larynx; in one, in the "lung;" and in one in the right thoracic cavity. In not a single instance did it occupy the left bronchial tube.

In thirty-four cases, subjected to operation, or general treatment, the extraneous substance was situated twice positively, and eleven times probably, in the right bronchial tube; four times certainly, and four times probably, in the left bronchial tube; seven times positively in the trachea, and fourteen times positively in the larynx. In two of the above cases a careful examination of the chest, during life, rendered it evident that the foreign substance, although found in the left bronchial tube after death, occupied the right tube of that name during the greater portion of the time which intervened between that event and the occurrence of the accident.

It will thus be perceived that the prevalent opinion that foreign substances are more frequently situated in the right bronchial tube than in the left is not imaginary, but well-founded. The difference, indeed, is most striking, and well worthy of remembrance, both in a pathological and practical point of view. It will be seen that the larynx is also a frequent seat of extraneous substances; but this circumstance is apparent rather than real, and depends upon the fact that the offending bodies, when impacted here, are more easily detected and extracted than when they are lodged in the trachea and bronchial tubes. Our knowledge does not enable us to state, with any degree of certainty, how often, relatively speaking, extraneous substances, when situated in the larynx, occupy the ventricles of that tube. The probability is that they do so in a little more than half the number of cases.

SECTION IV.

ENTRANCE OF FOREIGN BODIES.

The glottis, although by far the most common, is not the only avenue by which foreign bodies may reach the windpipe; occa-

sionally they enter the tube from without, either by penetrating the skin and muscles of the neck, as in the remarkable instance observed by De La Martiniere,[1] a French surgeon, or by gaining ingress through an artificial opening, as in wounds of the throat. In the latter case, the blood, which, under such circumstances is, to all intents and purposes, a foreign substance, often falls into the air-passages, causing great distress and sometimes even instant suffocation. In gunshot wounds similar effects occasionally arise from the introduction of pieces of wadding, or of the patient's clothing, which are intercepted by the opening, while the ball inflicting the mischief passes onward beyond the surface of the body, or buries itself deeply in its substance.

The case of De La Martiniere, just alluded to, affords an example of a foreign body entering the trachea from without, through the front of the neck, and producing all the distress consequent upon the introduction of an extraneous body by the natural and more common route. The patient was a boy, about ten years of age, the son of a card merchant, near Fontainebleau, who, in amusing himself with cracking a small whip, was suddenly seized with extreme difficulty of breathing, and soon fell into imminent danger of suffocation. He pointed to the trachea as the seat of his suffering. The surgeons, however, who were called to his assistance, having learned that he had not been away from his parents, and that he had put nothing in his mouth, concluded that there could be no foreign body in the air-passages, notwithstanding the symptoms were clearly indicative of such an accident. The sufferings becoming every moment more urgent and threatening, a full bleeding was resorted to as a remedy most likely to afford relief, but no benefit ensued. De La Martiniere was now (about an hour after the occurrence of the accident) requested to see the boy He had had convulsions, and was breathing most laboriously; the face was tumid and purple, the eyes protruded from their sockets, the extremities were cold, all consciousness was lost, and death was momentarily expected.

The surgeons who had seen the child in the first instance had not neglected to examine the fauces and œsophagus, but without mak-

[1] Observations on Surgical Diseases of the Head and Neck; selected from the Memoirs of the Royal Academy of Surgery of France. Translated by Drewry Ottley, p. 279: London, 1848.

ing any discovery. On inspecting the outside of the neck, De La Martiniere perceived a little red spot like a flea-bite in front, just below the cricoid cartilage, and on tracing this with his thumb and finger, he felt, deep under the skin, a small circumscribed swelling of the size of a lentil, and of unnatural hardness. The sensation could not have been more distinct through the thickness of the parts. Taking this swelling as his guide, he immediately made an incision through it as far down as the trachea, where he came in contact with a small body, projecting more than a line beyond the surface of the tube, and which he tried in vain to seize with his dressing forceps. Fortunately, he was provided with a pair of tweezers, with which he laid hold of and extracted it. On examining this body, it was found, to the surprise of every one present, to be a large brass pin, without any head, and fifteen lines in length, which had traversed the trachea from left to right, and even pierced its posterior wall.

The wound was healed in a few days, and the success of the operation could not have been more complete; for, as De La Martiniere very properly remarks, the child was recalled, as it were, from death to life. The pin, as was ascertained after the operation, had been tied to the extremity of the lash of the child's whip, from which, as he was cracking it, it escaped, and buried itself in the neck and windpipe.

The above case is one of the deepest interest, not only from its unusual character, but also on account of the judgment and skill exhibited by De La Martiniere, but for whose presence the patient would, no doubt, have been lost. "The scarcely visible red point on the skin," says he, "marking the passage of the pin, was what first drew my attention, and the sensation conveyed of a deeply-seated swelling determined me to cut down on it; the highly dangerous state of the child, whose death was evidently at hand, required the promptest relief; it was especially this consideration which decided me to act on indications that appeared clear enough after the favorable event, even in the opinion of those who before had remained idle spectators." One such case is enough to immortalize a surgeon.

Foreign bodies sometimes lodge in the *pharynx*, and from thence pass into the larynx, either by their own efforts, or, more properly speaking, in consequence of the pressure exerted upon them by the neighboring parts, or in consequence of the means employed

to extract them. Of the latter occurrence, at least apparently, an interesting case fell into the hands, several years ago, of Professor Eve, of Tennessee.[1] A negro boy, aged nine years, while eating beef-soup, swallowed a piece of bone, which stuck fast in the throat. Efforts were immediately made to dislodge it by emetics, forceps, probangs, and other means, but without success. Dr. Eve saw the patient, for the first time, about twenty-eight hours after the accident. There was now, besides the difficulty of swallowing, considerable hoarseness, and the edge of the bone could be distinctly felt by the finger thrust deeply into the pharynx. There was no cough, nor had there been any previously. After trying in vain for an hour with the forceps and other instruments to extract the foreign substance, the boy was put to bed, and the next morning, after having spent a bad night, and being much exhausted, another unsuccessful effort was made, in which he expired. Tracheotomy was immediately performed, and artificial respiration attempted, but without any benefit.

The piece of bone lay in the upper part of the pharynx, through the anterior wall of which it projected into the larynx, below the rima of the glottis. It was thin and sharp, with jagged edges, and of an oblong form, measuring one inch in one direction, and half an inch in the other. Dr. Eve, in commenting on the case, remarks "that the boy evidently died from exhaustion consequent upon the treatment, and the impediment to the breathing caused by the projection of the bone into the larynx."

Some years ago, a mechanic visited the Middlesex Hospital, London, soon after dinner, complaining that he felt something in his throat, which was examined, but nothing was detected. A tube was passed into the stomach, and a quantity of mutton broth, which he had taken for dinner, brought up. He came again next day, but still nothing could be discovered. Five days afterwards word was sent that he was dead. On dissection, a portion of the vertebra of a sheep was found to have made its way, by ulceration, from the pharynx to the lower part of the trachea.[2]

Foreign bodies sometimes enter the lungs through the *walls* of the chest, instead of passing into them by the more natural and

[1] Southern Med. and Surg. Journal; New York Journ. Med. and the Coll. Sciences, vol. iii. p. 131, N. S., 1849.

[2] Mr. Arnott, in London Lancet, vol. i. p 803, 1839-40.

common route of the air-passages. The effects which may follow such an accident are various, and, therefore, worthy of brief examination. The number of such cases is too limited to enable us to offer anything more than some very general conclusions. In the great majority of instances, the presence of the extraneous substance leads to serious structural changes in the pulmonary tissues, followed, sooner or later, by the death of the patient. This may happen whether the substance be expelled or retained. In the former case, however, the patient will stand a better chance for his life than in the latter, especially if, at the time of the ejection of the foreign body, the system was not totally wrecked by the previous irritation, occasioned by its contact. Under such circumstances, death is produced very much in the same manner as in ordinary phthisis; indeed, it not unfrequently happens, in this case, that tubercular matter is deposited in considerable quantities in the tissues around the extraneous substance, thereby complicating the traumatic lesion, and expediting the fatal event.

When the foreign body is retained for a long time, it is generally encysted, and so becomes partially, or, it may be, completely harmless. Such a termination, however, is extremely rare; when it does occur, the innocuous period is usually of short duration. A process of elimination is instituted, attended with suppuration and hectic irritation, and by an attempt, by no means always a successful one, at dislodgement of the intruder.

In the subjoined cases, the extraneous bodies were surrounded each by a distinct and well-organized cyst.

A man, whose history is related by Dr. M. H. Houston,[1] of Wheeling, Virginia, when twenty years old, accidentally shot himself, the contents of his gun lodging in his left side. The ball, which entered beneath the axilla, between the fifth and sixth ribs, was extracted along with a piece of bone immediately after the receipt of the injury. After many months of suffering, the man recovered from the effects of the wound, so as to be able to marry and attend to his ordinary business. He was left, however, with a peculiar cough, and became dyspeptic, experiencing frequent attacks, especially during the summer months, of flatulent colic, diarrhœa, and cholera morbus; his health was never good, he was emaciated, and his countenance had very much the appearance of tripe. At the

[1] American Journal of the Medical Sciences, N. S. vol. ix. p. 342.

age of about forty-five he died. A cavity, communicating with several bronchial tubes, existed in the substance of the left lung, opposite the space between the fifth and sixth ribs, at their junction with the spinal column, containing a smooth, firm substance, in shape not unlike that of a silk-worm, and consisting of a piece of coarse domestic linen, evidently the patch of a bullet, about two inches and a half in length, and two inches in width, when unrolled. The cavity was lined by a smooth, tough membrane, and communicated with several small bronchial tubes, the opening into one of which was funnel-shaped, and accommodated the end of the linen roll, which had thus, by its projection, kept up the cough and pulmonary irritation.

The other case has been related by Mons. Broussais, in his *History of Chronic Phlegmasiæ*.[1] A man, aged thirty-three, was shot at the battle of Novi, the ball entering the upper and lateral part of the right side of the neck. The food and drink escaped for some time at the wound, which, however, at length closed, without the foreign body having been extracted. From this time on the patient had more or less cough, but was well enough to retain his situation in the army for the next two years, when he was obliged to abandon it. His health now improved, and for four years he was tolerably well. He then became subject to dyspnœa, nocturnal cough, and hectic irritation, with slight pain in the chest, and inability to lie on the right side. He had no other symptoms of pulmonary disease. He finally died completely exhausted. The whole of the left lung was hepatized, and firmly attached to the wall of the thorax; it was excavated into a number of cavities, some of them as large as a hen's egg; and towards its base, not far from the principal divisions of the left bronchia, lay the ball, received seven years previously, in a distinct cyst, just large enough to contain it, and surrounded by indurated pulmonary tissue. The right lung was sound, without adhesion, and unusually large.

[1] Translated by Hays and Griffith, vol. i. p. 305, Philadelphia, 1831.

SECTION V.

EXPULSION OF FOREIGN BODIES.

As foreign bodies most commonly enter the air-passages by the glottis, so also are they most generally expelled by that route. There are, however, as might be expected, exceptions to this rule, and these are of sufficient interest and importance to require brief examination.

When the expulsion takes place at the glottis, the extraneous substance usually escapes by the mouth, frequently, indeed, with a good deal of force, during a violent expiratory effort. Occasionally, however, it passes into the stomach, where it is either digested, or pushed on into the bowels, to be voided afterwards along with the feces. The expulsion may take place spontaneously; or it may be effected under the influence of various remedies, as emetics, sternutatories, inversion of the body, or the operation of bronchotomy. In whatever manner it is brought about, there is no certainty in regard to the period of its occurrence. In one case, for example, it may take place almost immediately after the accident, while in another it may be delayed for days, weeks, months, and even years. Even bronchotomy does not always insure the speedy ejection of the offending body; on the contrary, we not unfrequently see cases where the only apparent good from the operation is relief of spasm of the glottis, the extraneous substance being, perhaps, permanently retained, or, at any rate, not ejected until some time afterwards, perhaps, indeed, not until the wound is entirely cicatrized. Nor does the expulsion, after bronchotomy, necessarily take place at the artificial opening, though in the majority of instances it undoubtedly does so; in many cases the substance escapes by the glottis, as in the spontaneous form of the accident.

The following cases, the types of numerous others, may be appended as illustrations of this mode of expulsion.

A child, aged twelve months, having inhaled part of a grain of roasted coffee, was instantly seized with the characteristic symptoms of a foreign substance in the windpipe. The paroxysms becoming more frequent and alarming, tracheotomy was performed at the end of forty-two hours after the accident, by my friend, Pro-

fessor Gilbert,[1] of Philadelphia. As the extraneous body did not make its appearance at the opening, a probe was cautiously passed, first, down into the bronchial tubes, and then up into the larynx, but without encountering the intruder. The child having been observed to swallow immediately after the operation, Dr. Gilbert concluded that the substance had descended into the stomach; a conjecture which was satisfactorily verified the next day. In another case, the same surgeon successfully tracheotomized a child three years and a half of age, on account of a piece of raw sweet potato. The moment after the opening was made the patient swallowed, and exclaimed: "Now it is out." All the urgent symptoms immediately disappeared, and prompt recovery was the consequence.

Foreign bodies, introduced into the air-passages by the glottis, are sometimes expelled through an abscess, ulcer, or fistula in the walls of the chest. Of the possibility of such an occurrence numerous examples are upon record. Various substances, as bullets, wadding, tents, and splinters, may be thus disposed of, after having been retained for an indefinite period in the bronchial tubes and pulmonary tissues. Dr. Stanski,[2] in an interesting monograph on the subject, mentions a curious instance in which a spike of oat, three inches in length, was thus discharged. The subject of this remarkable accident was a female, twenty years of age, a patient in the Cochin Hospital, of Paris. It appeared that she had labored for some time under symptoms of phthisis, and that, a fortnight before her admission, she had inadvertently inhaled an ear of wild oats. The immediate effects of the accident were succeeded by continual convulsive coughing; and a few days afterwards inflammation of the right lung set in. A copious expectoration of very fetid matter followed; and, upon her admission, an abscess containing twelve ounces of offensive pus, similar to that discharged by coughing, was detected in the right lumbar region. The evacuation of the abscess afforded considerable relief; but cavernous and amorphic respiration, with pectoriloquy, could be heard at the base of the right lung, and subsequently another abscess formed between the ribs, a little below the inferior angle of the scapula. After this was opened, a seton was passed from one into the other, and by drawing the tape upwards the foreign substance, broken into two,

[1] American Journal of the Medical Sciences, vol. xxi. p. 74, 1851.

[2] Gazette Médicale de Paris, Juillet, 1837; Brit. and For. Med. Rev. vol. vii. p. 251.

was entangled and brought out. The sores continued to discharge for a considerable time, the hectic irritation progressed, and the woman died from phthisis seven months after her admission into the hospital. The dissection of the body revealed extensive tubercular disease of the summit of both lungs, and extensive adhesions of the right of these organs to the wall of the chest, with the remains of a sinus leading to one of the external openings.

Dr. Stanski asserts that he is acquainted with as many as twenty similar cases, reported by different writers. The spikes of various grasses, placed in the mouth, are particularly prone to slip into the windpipe. To enter the larynx it is necessary that the lower extremity of these bodies should be introduced first, otherwise the asperities upon their surface will not permit them to descend.

The following case, communicated to me by Dr. A. G. Avery, illustrates the mode of expulsion under consideration: A child, eighteen months old, while amusing himself with the tops of a juniper-tree, allowed a little sprig to pass into the throat. His mother, in attempting to remove it, pushed it down into the windpipe, where it immediately gave rise to the ordinary effects consequent upon such accidents. After much cough and irritation for nearly a year, an abscess formed in the right lung, and at length pointed between the fifth and sixth ribs, in the vicinity of the nipple. It discharged a large quantity of thick, fetid matter, greatly debilitating the little sufferer. The part finally became fistulous, and, upon examining it one day, the foreign body was seen in its interior, from which it was at once extracted. The child soon began to improve, but continued feeble for a long time; the right lung seemed to have been rendered totally unfit for the purposes of respiration, and the corresponding wall of the chest was caved in, so as to lead to serious deformity. The pectoral muscles and the muscles of the right arm were remarkably thin and flabby, and even the bones on that side appeared to have been stunted in their development. This was eight years after the accident. The opposite side of the chest, at this period, was preternaturally full, forming a striking contrast with the affected one.

When the extraneous substance enters through the walls of the chest, its expulsion may be effected in different directions. The most natural route, and, consequently, also, the most common, is the windpipe. The ejection, under such circumstances, is always, as a necessary effect, preceded by ulcerative action, establishing a

communication with some bronchial tube, in the same manner as in tubercular phthisis. When the opening thus made is of adequate dimensions, the substance, unless very heavy, may be readily coughed up, followed, in favorable instances, by the recovery of the patient; but when the reverse is the case, spontaneous expulsion is hardly to be looked for; at any rate, it could be accomplished only with immense difficulty, and, as it were, by chance, accident, or good luck.

Of the above mode of expulsion several remarkable examples are on record; among others that of Fabricius Hildanus,[1] of a man who was stabbed in the chest with a small sword. The wound, which had been crammed, as was then the custom, with linen, gradually healed; but the patient became phthisical, and finally, at the end of three months, and when apparently nearly exhausted, threw up, in a fit of coughing, two tents, which had been allowed to pass, through carelessness, into the substance of the lung. In a case mentioned by Tulpius,[2] of a Danish nobleman, a similar substance was coughed up at the end of six months. Pigray, first surgeon to Henry IV., gives the particulars of a case of a soldier, who, about four months after his recovery from a gunshot wound in the chest, discharged from his windpipe a fragment of one of his own ribs; it was three-fingers breadth long, and of considerable thickness, and the man recovered without any untoward occurrence.[3]

Finally, the foreign body occasionally, though very rarely, escapes through the walls of the chest, by retracing, as it were, its former steps, or retraversing the route by which it entered. In some instances, again, also very uncommon, it forms a new passage, just as tubercular matter sometimes does. Lastly, the extraneous substance may leave the lung, and pass into the cavity of the pleura, where it may either become encysted, or, as more generally happens, excite fatal inflammation.

[1] Opera Omnia, centuria prima, obs. 46, p. 41, 1682.

[2] Lib. 2, obs. xv.

[3] Louis's Second Memoir on Bronchotomy, in *op. cit.* p. 268.

CHAPTER II.

IMMEDIATE EFFECTS OF FOREIGN BODIES.

Persons are sometimes instantly suffocated from the ingress of a foreign body into the windpipe, or from its lodgement upon the rima of the glottis. In such a case, the respiration may be permanently arrested in a moment, in the twinkling of an eye, as effectually as from the administration of prussic acid, or a severe blow upon the head. A few months ago, the son of a gentleman near Frankfort, an intelligent, healthy lad, about nine years of age, perished apparently in this manner. He had gone into the neighborhood with a number of other children, for the purpose of gathering persimmons. As they were returning, full of life and spirits, playing and gambolling about, the youth suddenly fell down, and instantly expired. No dissection was made; but who, familiar with the history of foreign bodies in the windpipe, can doubt that this child was eating some of the fruit which he had gathered, and in an unguarded moment allowed it to slip into the larynx? A case is mentioned in the *Archives Générale de Médecine*, of a man who was ravenously eating a piece of beef, a portion of which descended into the trachea, and instantly suffocated him. Many years ago, a remarkable instance of a similar kind occurred in London. A beggar, asking alms in the street, while he had food in his mouth, suddenly fell down and expired. His body was carried to a dissecting-room, where, being opened, a piece of cabbage-stalk was found in the trachea. He had been eating cabbage at the time of the accident.[1]

Drunken persons occasionally die in the same manner, during attempts at vomiting. In the exhausted condition of the system, consequent upon the inordinate use of ardent spirits, the contents of the stomach are lazily ejected, thus allowing some of the ingesta as they proceed upwards to lodge against the rima of the

[1] Cline's Lectures on Surgery, Lond. Med. Gaz., vol. xxiii. p. 38.

glottis, or even to descend into the windpipe. Numerous examples of death produced in this way might be related, if they could be of any use in illustrating the history of the present topic.

The interesting case observed by Corvisart is generally known. This celebrated physician being desirous of exercising an unexpected supervision of some part of the clinical ward at La Charité, visited it one evening contrary to his custom, and suddenly entered the apartment of the steward, who had been indulging in a too plentiful repast. Taken by surprise, the man became sick at the stomach, but making a violent effort to repress vomiting, he fell to the ground, and expired. On examining the body, the larynx, trachea, and bronchial tubes were found filled with half-digested food.[1]

Diseases of the epiglottis, disqualifying it for the due performance of its functions, remarkably predispose to this occurrence. In the case of the London beggar, above referred to, the epiglottis had been destroyed by ulceration.

The effect of the passage of a drop of water into the larynx is familiar to every one. All fluids, however simple, are capable, when introduced into this tube, of exciting the most violent, spasmodic, and suffocative cough; but the impression is evanescent, for the reason that liquids can produce no mechanical obstruction to respiration. The moment the spasm subsides, the breathing is re-established. All solid articles, on the contrary, whatever may be their character, will, by entering the windpipe, or resting against the mouth of the larynx, endanger life by suffocation.

A person laboring under delirium tremens, and confined so as to be unable to move, may, in an effort at vomiting, instantaneously perish from the introduction of food into the air-passages. Many such cases, it is to be feared, occur in practice, without the real cause of the dissolution being always known. The following one is mentioned by Mr. W. P. Ormerod, in his *Clinical Collections and Observations in Surgery*, published at London, in 1846. "One evening, a nurse in great alarm, called out that some one in the hospital was very ill. The house surgeon went directly to his relief, but before he reached the ward the patient was dead." A man with delirium tremens, and requiring restraint, had suddenly vomited, and not being able to move readily, some of the ingesta had passed into the trachea and produced suffocation.

[1] Laennec's Treatise on the Diseases of the Chest, by Forbes, p. 140. New York, 1830.

"The same accident," as Mr. Ormerod justly observes, "may occur in another way. A person has both thighs broken, and is to a certain degree fixed by the feet being fastened to the ends of the splints or bottom of the bed. If, under such circumstances, he is obliged to vomit he cannot turn, but is taken unawares, and may be instantly suffocated."[1]

A patient, with anthrax, under the care of the late Mr. Carmichael, in the Richmond Hospital, Dublin, in the year 1822, while eating his dinner of boiled mutton, was suddenly seized with difficult respiration, and before the house surgeon could reach him from an adjoining ward, he had suffocated. On dissection, death was found to have been caused by a tough piece of meat, which completely filled the mouth of the larynx.[2]

A case similar to the above is mentioned by Thomas Bartholin.[3] "Sueno Olai, juvenis robustus, sed pallida faciei colore, annorum 19, cum in cœna convivis, jussu hospitis inserviret, linguæ frustulum bubulæ, in patina residuum, clam et festinanter ori injecit, unde statim vox sublata et respiratio, nec caro degluta conatu ullo aut vi ulla potuit elice, antequam advocatur chirurgus, suffocatur. Postridie cadaver apertum fuit, inventumque est frustulum illud linguæ bubulæ, pondere unciæ unius cum dimidia, *inter epiglottida et laryngis* rimulam se insinuasse, totamque laryngem obturasse, tam arcte ut vix manu eximi potuerit; unde mirum non est subito et voccm cessasse et perisse respirationem."

The following interesting case occurred, a few years ago, at Kensington, near London.[4] A maid-servant, aged 23, was waiting at dinner, and after removing one of the dishes, ran hastily into the kitchen, in a state of extreme distress, which she could explain only by pointing to her throat, for she was entirely deprived of the power of speech. In a few moments she fell upon the floor struggling violently, and in another minute she was dead. An opening was made with all possible expedition through the crico-thyroid membrane, but too late to be of any benefit. On the following day, by order of the coroner, an examination was made of the body. The face and neck were much congested, and of various shades of blue and purple; and the superficial veins generally were distended

[1] Clinical Collections and Observation in Surgery, p. 177.

[2] George Bushe, M. D., New York Medico-Chir. Bulletin, vol. ii. p. 59, 1832.

[3] Cent. i. Histor. xi.

[4] Lond. Med. Gazette, Dec. 8, 1848.

with black blood, while the intervening skin was pale and flaccid. The abdominal and thoracic organs were healthy, but much engorged with dark fluid blood. A piece of meat, weighing about six drachms, of a triangular shape, and measuring two inches and a quarter at its widest part, was found firmly wedged in between the wings of the thyroid cartilage, so as to close completely the mouth of the larynx; the epiglottis was pressed downwards, and twisted somewhat upon itself, probably in consequence of a last violent expiratory effort. The morsel was situated beneath the base of the tongue, in such a manner that, had the mouth been opened during the struggles of the patient, it would certainly have escaped notice; nor would it, in all likelihood, have been encountered, had a probang been passed down the œsophagus.

Suffocation is occasionally produced by the sudden ingress of blood into the windpipe. This sometimes happens during operations upon the mouth and throat, and even during the performance of tracheotomy itself, as some of the instances hereafter mentioned testify. Sir Astley Cooper relates a case of wound of the neck, in which a patient was suffocated by a large clot of blood pressing on the trachea. The person lived an hour, and probably died from want of the necessary attention. Tracheotomy might easily have saved his life. Some years ago a patient in the Middlesex Hospital, London, was suffocated by blood pouring down the windpipe from an ulcerated lingual artery. The lungs contained, in various situations, solid, dark-red masses, precisely resembling those described by pathologists as constituting pulmonary apoplexy.[1] In such a case tracheotomy would, of course, be unavailing, except at the very commencement of the attack, before the blood has had time to become impacted in the air-vesicles of the lungs.

Violent, and, indeed, fatal effects are occasionally produced by the impaction of foreign bodies in the pharynx and œsophagus. Two circumstances may induce these effects, namely, mechanical occlusion, and spasm of the glottis. The following examples will serve to illustrate the subject:—

The celebrated case of Habicot, detailed in the Memoirs of the Royal Academy of Surgery of France, is well known to the profession. A lad, aged fourteen, having been told that gold, when swallowed, was perfectly harmless, attempted to dispose in this way

[1] Mayo's Outlines of Pathology, p. 500, London, 1836.

of nine pistoles, wrapped up in a piece of cloth, in order to hide them from thieves. The packet being too large to pass the œsophagus, lodged in the narrow part of the pharynx, where, by its pressure upon the windpipe, it produced the most intense distress, attended with a sense of suffocation, and a livid and swollen state of the face and neck. Various attempts were made, but without success, to extract the packet. At length, perceiving that the patient was on the point of perishing, Habicot resolved to perform bronchotomy. The operation was no sooner done than all the bad symptoms vanished; the breathing being immediately re-established, and the countenance resuming its natural appearance. Unable to extract the pistoles, Habicot pushed them with a leaden probe, into the stomach, from whence they descended into the bowels, and were discharged, at different times, from the anus. The wound in the trachea soon healed, and the patient happily recovered.

Nicol. G. P. Backers[1] mentions the case of a young man who was instantly suffocated by the lodgement of a piece of meat in the upper part of the œsophagus. Fabricius Hildanus refers to two similar instances.[2] In the first, an infant was strangled by the impaction of a piece of hard cake; and in the second, a man lost his life by a piece of meat accidentally arrested in the tube, just behind the larynx. Modern observation has furnished many similar examples.

[1] Miscell. Curios.

[2] Cent. i. obs. 35; as quoted by Bushe.

CHAPTER III.

PATHOLOGICAL EFFECTS OF FOREIGN BODIES.

The foreign substance may produce various changes in the structures with which it lies in contact, as well as in those in its neighborhood. Occasionally, though rarely, remote parts of the lungs, of the trachea, and even of the larynx become affected, either primarily or secondarily, in consequence of the relations thus induced. Practically, these facts are of great importance, and should not be overlooked when we are called upon to investigate cases involving the presence of extraneous bodies in the air-passages.

One of the most common effects is inflammation of the *mucous membrane*, generally limited in extent, and always attended with congestion of the capillary vessels. When the foreign body is bulky, and occasions great inconvenience, or is retained for a long time, the morbid action becomes diffused, and often spreads many inches beyond the part originally affected. Under such circumstances it is not uncommon to observe patches of coagulating lymph, either alone or in union with softening of the mucous lining. In chronic cases the mucous membrane is apt to become thickened, more or less indurated, and deeply congested. Another occurrence is *ulceration*, which, however, is usually of small extent, and is generally limited to the parts in immediate contact with the extraneous body. Sometimes, though rarely, the foreign substance is partially surrounded by lymph, which thus retains it in its situation. In a case mentioned by Mr. Bullock, in the eighteenth volume of the *London Medical Gazette*, the lymph appeared to be organized, and existed in such abundance as nearly to close the cavity of the upper portion of the windpipe.

The changes here enumerated are almost always accompanied by a great increase, at first, of the normal secretion, and, subsequently, by more or less *muco-purulent* matter. The quantity of these fluids varies from a few drachms to several ounces in the twenty-four

hours, and is generally in direct proportion to the irritation occasioned by the extraneous substance. After death, the bronchial tubes are sometimes literally filled with muco-purulent matter. The secretion is usually, at first, thin, frothy, and perfectly clear; but by degrees it becomes thick, ropy, and more or less opaque, precisely as in ordinary bronchial irritation. When it assumes a muco-purulent character, it is either whitish, or of a yellowish, greenish, drab, or brownish color. Occasionally it is excessively fetid, especially when it proceeds from the lungs, in consequence of the protracted retention of the foreign body.

When the extraneous substance is retained in the bronchial tubes, serious structural lesions are liable to occur in the *lungs*. Of these changes the most important, by far, is inflammation, which sometimes involves an entire lobe, or even the whole of the corresponding organ; sometimes, indeed, the mischief extends even to the other lung, or both lungs may suffer simultaneously, in consequence of the bronchial tubes being alternately occupied by the intruding body. This fact, which is by no means new, should teach us the absolute necessity of carefully examining both sides of the chest in every case involving a suspicion of the existence of such a substance.

The textural changes produced in the lungs by the inflammatory action do not differ, in any respect, from those accompanying ordinary pneumonia. At first, the parenchymatous substance is merely engorged, and preternaturally humid; but as the disease advances it undergoes hepatization, and, finally, if the action is perpetuated, it becomes infiltrated with purulent matter. In some cases, especially in those of long standing, abscesses form, and continue to discharge for weeks, months, and even years.

In whatever manner these *abscesses* form, whether under the influence of acute or chronic inflammation, they generally occur at the seat of the obstruction, or in its immediate vicinity. It is only in protracted instances, and then very rarely, that they are found at remote points. Their contents are generally of an unhealthy character, being more or less fetid, tinged with blood, and intermixed with mucus. The pulmonary tissues around them are usually densely hepatized, and deeply discolored.

Sometimes the foreign substance, especially when retained for any length of time, induces a deposit of *tubercular* matter in the tissues immediately adjoining it. A remarkable instance of this occurrence

fell under my own observation, many years ago, in a child nearly nine years of age. About three months before her death, which was caused by tubercular arachnitis, she accidentally inhaled a part of a thread of crewel, such as is used for worsted work, and this lodged in one of the divisions of the left bronchus, producing occasional attacks of cough, but no perceptible change in the general health. The intracranial affection was of short duration, and apparently entirely unconnected with the foreign substance. On dissection, the day after death, the piece of thread was found to be completely encysted by a layer of false membrane, in the immediate vicinity of which there were numerous tubercles, nearly all in a crude state, and varying in size from a mustard-seed to that of a currant. In a case reported by Dr. Andriessen, in the *Wochenschrift für die Gesammte Heilkunde*, for 1837, both lungs were filled with tubercles and caverns. The patient, a lad, aged ten years, had inhaled a prune-stone, which, although it was ejected some time afterwards, caused death in a little more than three months from the time of the accident. In a case narrated by Shrœder van der Kolk,[1] the left lung contained numerous tubercles with several vomicæ; and in the left bronchial tube, about an inch from the trachea, was lodged a splinter of bone. The right lung was similarly affected, but in a much less degree. The patient was a female, aged twenty-five years, and the prominent symptoms were incessant cough, pain in the chest, anxiety, hard and frequent pulse, emaciation, and hectic fever, followed by death in about three months.

Œdema of the larynx is sometimes observed after this accident. It occurred only in one of the cases, the particulars of which are given by Dr. G. R. Morehouse,[2] of Philadelphia, who treated the patient, a girl, aged ten years. The foreign substance was a piece of almond-shell, which had been drawn into the larynx, two days before the operation. As soon as the oozing from the incision had ceased, an examination was made for the foreign body, when it was discovered that effusion had taken place in the submucous cellular tissue, almost obliterating the upper part of the trachea, and rendering it utterly impracticable to pass an instrument through the rima of the glottis, with the hope of extracting the shell. As the child was much exhausted, she was put to bed until the next morning,

[1] Observationes Anatomico-Pathologicæ. Amstelodami, 1826.
[2] Phila. Medical Examiner, N. S., vol. vii. p. 216.

when, upon dividing the thyroid cartilage, the swelling of the trachea was found to be much diminished, though the vocal chords were still apparently in as close proximity as ever. The operation being completed, a tube was introduced into the wound, and worn until the œdema had entirely subsided. The child soon recovered. Doubtless this occurrence is much more frequent after this accident than is generally supposed, or than the facts hitherto published would seem to indicate.

Another effect occasionally witnessed after this accident is *pulmonary emphysema;* a circumstance not at all surprising when we reflect upon the great obstruction so frequently produced by the presence of the foreign body. The occurrence is probably much more common than the results of post-obit examinations would lead us to infer. It was noticed, however, in only a few of the cases analyzed in this work. It usually exists in union with other morbid changes, and presents itself in various degrees. In the case observed by M. Lescure,[1] the lungs were emphysematous in their entire extent, as well as much engorged, but the air had not reached the external surface of the body. The patient was a girl, aged four years, who died at the end of sixty hours, from the impaction of a piece of almond-shell in the upper part of the trachea. Mr. W. P. Ormerod[2] met with an instance in a girl four years old, whose left lung had been rendered emphysematous over a considerable portion of its outer surface from general dilatation of the air-cells, caused by the presence of a pebble at the bifurcation of the trachea. The lower portion of the right lung was solidified and slightly infiltrated with pus. The lining membrane of the windpipe and bronchial tubes was red and covered with puriform matter. The foreign substance was of the size of a kidney-bean. In a case mentioned by Mr. W. G. Carpenter,[3] the foreign substance, a piece of ivory, consisting of four artificial teeth, was retained for thirteen years, and occasioned the most extensive lesions, as emphysema and tubercles of the left lung, and collapse of the right, with enormous sero-purulent effusion into the right thoracic cavity. In the celebrated case of M. Louis,[4] elsewhere described, the emphysema affected the lungs and anterior mediastinum, as well as the neck on

[1] Mém. de l'Acad. Royale de Chir. t. v. p. 349.

[2] Clinical Collections and Observations in Surgery, p. 179. London, 1846.

[3] Guy's Hospital Reports, vol. vii. p. 353. London, 1842.

[4] Second Memoir on Bronchotomy.

each side of the clavicle. The patient, a girl seven years of age, died at the end of three days from the inhalation of a kidney-bean, lodged in the trachea.

The *bronchial lymphatic ganglions* are also liable to suffer in these affections. The most common alterations are enlargement, preternatural vascularity, and softening of their substance. The occurrence of suppuration is infrequent.

The morbid action sometimes extends to the *pleura*, leading to effusion of serum and lymph, and also occasionally, to the formation of pus. These occurrences, which are not surprising when we reflect upon the nature of the accident which gives rise to them, were met with in a number of the cases detailed in this work. In one, that of a little child, under the care of Mr. Bullock, of England, the right thoracic cavity contained upwards of a pint of turbid serum, intermixed with flakes of lymph. A false membrane existed on the lower part of the right pulmonary pleura. The child was six years of age; and eight weeks elapsed before she died from the effects of the retention of the foreign body. In a case mentioned by Lescure, the right cavity of the chest was filled with pus, and the corresponding lung was almost completely destroyed. The foreign substance, a louis d'or, had been retained five years and a half. Mr. W. G. Carpenter, of London, gives an instance where, death taking place at the end of thirteen years, the cavity of the chest contained a large quantity of fetid gas and five pints of sero-purulent fluid. The man had been seized with acute pleurisy a few days before death, in consequence, apparently, of the irritation produced by the foreign body, a piece of ivory, consisting of four artificial teeth, which had escaped into the thoracic cavity, and thus induced the fatal mischief.

In the case of a young man, mentioned by Morton,[1] the cavity of the pleura contained not less than six pints of purulent matter. He had several months previously inhaled three nails, which were found in the midst of an abscess in the substance of the lungs, a little below the division of the bronchial tubes. The suffering had been so slight for some time after the accident that the man was able to pursue his ordinary business, and to enter into the matrimonial state. On the night after the marriage, however, he became alarmingly ill, and at the end of five weeks he expired from the effects of pulmonic disease, accompanied by hectic fever.

[1] Phthisiologia, lib. iii. cap. vi. p. 143. London, 1689.

Extensive adhesions occasionally form, as a result of the inflammation produced by the presence of the foreign substance between the opposite sides of the pleura; and now and then thick layers of false membrane are seen. In several of the cases herein mentioned, these appearances were very conspicuous, and induced the belief that the lymph had been poured out a long time previously to death.

The morbid deposits, above described, are most apt to form, and to exist in greatest quantity, in those cases in which the foreign substance is situated near the surface of the lung, or when it has accidentally fallen, by ulcerative action, into the pleuritic cavity. Sometimes they take place soon after the accident, while at other times they occur only a few days before death.

It is a singular fact that the pathological changes now enumerated may all occur, to a greater or less extent, in cases where the obstruction is seated, not in the lungs or bronchial tubes, but in the larynx or upper portion of the trachea. In Mr. Bullock's case, above referred to, the foreign body lay partly within the cricoid cartilage, and partly within the trachea; and yet the lungs, especially the right, were highly inflamed, hepatized, and infiltrated with pus; the air-tubes were loaded with muco-purulent fluid; the bronchial ganglions were enlarged and suppurating, and the right cavity of the pleura contained a pint of turbid serum.[1]

In a few instances the *heart* and *pericardium* have been found inflamed, but whether from an extension of the morbid action from the respiratory organs, or from embarrassment induced in the pulmonary and cardiac circulation, is a circumstance which it would be difficult, if not impossible, to determine. Possibly, both these causes may exert a prejudicial influence in this way. In a case mentioned by Mr. Solly, of London, a large abscess had formed in the mediastinum, in connection with pericarditis. The patient, who had inhaled a pebble, died several weeks after the accident, after having had several severe attacks of bronchitis.[2]

In a case recorded by the late Mr. Herbert Mayo,[3] of London, and elsewhere alluded to, the *liver* was seriously implicated. It occurred in a lad, aged twelve years, in consequence of the inhalation of an ear of rye, which caused pulmonary irritation and hectic

[1] London Medico-Chir. Trans. vol. xxiii. p. 119.
[2] London Lancet, vol. i. p. 480. London, 1849.
[3] Outlines of Pathology, p. 506. London, 1836.

fever, with the most fetid expectoration. The boy gradually sunk; and, on dissection, the extraneous body was discovered in an abscess, which was common to the lung and liver, the latter of which had become involved by an extension of the morbid action across the diaphragm.

Finally, when abscesses form after this accident, whether as a consequence of simple pneumonia, or of the softening of tubercular deposits, the matter is either retained, or, as more generally happens, it passes into the bronchial tubes, whence it is afterwards discharged by coughing or expectoration. Occasionally, as in several of the cases mentioned in the present treatise, it points externally at one of the intercostal spaces, where it sometimes forms an opening through which the foreign body, which induced the mischief, ultimately escapes. In a most interesting and instructive case, recently communicated to me by Dr. John L. Atlee, of Lancaster, Pennsylvania, a large abscess, situated in the left lung, was ruptured during the attempts which were made to extract the foreign body, a piece of the kernel of a hickory-nut, which was ejected along with the purulent fluid. The patient, a boy, five years old, soon recovered from the accident, which had occurred ten weeks and a half before he was tracheotomized.

CHAPTER IV.

SYMPTOMS OF FOREIGN BODIES.

THE symptoms which follow and accompany this accident, may be divided into those which take place at the moment of the introduction of the foreign body, and into those which arise in consequence of its sojourn in the air-passages. This distinction, although recognized by most writers, has not, it seems to me, received the consideration to which its importance, practically speaking, entitles it. It will be my object, in the succeeding remarks, to place the subject, if possible, in its true light.

The moment a foreign substance, however small, touches the windpipe, it is sure to excite severe distress and coughing, on account of the spasmodic action of the muscles of the larynx. We have a familiar illustration of this in the suffering which occurs when a drop of water, a crum of bread, or a particle of salt accidentally slips into the glottis. Instantly the most violent distress is excited, which generally continues until the intruder is dislodged from a situation which Nature never intended it to occupy, and where it could not remain long without causing serious structural mischief. But these symptoms are, in general, slight and transient compared with those that attend the intromission of a foreign body, properly so called. In the latter case the patient is usually in imminent danger of suffocation, and he may, indeed, regard himself as being very fortunate if he escapes with his life. Cases without number might be cited, were it deemed necessary, to confirm the truth of this remark. In the great majority of instances, the patient is seized with a feeling of annihilation; he gasps for breath, looks wildly around him, coughs violently, and almost loses his consciousness. His countenance immediately becomes livid, the eyes protrude from their sockets, the body is contorted in every possible manner, and froth, and, sometimes, even blood issue from the mouth and nose. Sometimes he grasps his throat, and utters

the most distressing cries. The heart's action is greatly disturbed, and not unfrequently the individual falls down in a state of insensibility, unable to execute a single voluntary function. In short, he is like one who has been choked by the hand, or by the rope of the executioner. Sometimes a disposition to vomit, or actual vomiting, occurs immediately after the accident, especially if it take place soon after a hearty meal. The relief occasionally experienced from this source is very great. In some instances, again, there is an involuntary discharge of feces and even of urine.

Several instances are mentioned in which the patients threw up a considerable quantity of pure blood during the violent coughing immediately consequent upon the accident. This occurred in a case observed by Mr. Cock, of London, in which a sixpence slipped down the throat, and at first lodged in the larynx, but afterwards fell into the trachea. Violent coughing, with the most distressing sense of suffocation, instantly took place, and during the paroxysm the patient threw up a quantity of blood.

The duration of the first paroxysms varies from a few seconds to several minutes, or, in severe cases, as when the foreign body is arrested in the larynx, even to several hours. With the restoration of the respiration, the features resume their natural appearance, and the patient recovers his consciousness and power of speech. The voice, however, frequently remains somewhat altered, the breathing is more or less embarrassed, and the individual is harassed with frequent paroxysms of coughing, attended often with a recurrence of all, or nearly all, the original symptoms. Thus the case may progress for an indefinite period, until the foreign body is expelled, or until it produces death by functional or organic disease of the air-passages.

The calm which ensues after the first paroxysms have passed away varies very much in its duration. Occasionally it lasts for many hours, or, perhaps, even a whole day and night; but generally it is comparatively short, not exceeding fifteen, twenty, or thirty minutes. The paroxysm then recurs, and after having continued a few seconds, probably with great violence, the parts become again tranquil, only, however, to be again excited into action by the irritation of the extraneous substance.

Should the obstruction be kept up, even if it be only for a few days, the patient will be in twofold danger; for he will not only be liable to be suffocated at any moment by the foreign body passing

up into the larynx, during a paroxysm of coughing, but the probability is that the lungs will resent its presence by taking on inflammation, which no skill, however well directed, can always effectually arrest. The symptoms denotive of these *secondary affections* are liable to much diversity, and it is, therefore, necessary that they should be examined somewhat in detail; otherwise it will be impossible to appreciate their due practical import. The most prominent and important of these symptoms are cough, an altered state of the voice, expectoration of different kinds of fluids, pain in the larynx, trachea, and chest, changes in the respiration, as evinced by auscultation and percussion, emphysema, inability to lie in certain postures, and impairment of the general health.

1. *Absence of Symptoms.*—The symptoms just enumerated do not come on with any regularity; and cases occasionally occur in which their appearance is postponed for an unusually long period. The foreign body, under such circumstances, seems to be in a state of latency, causing little or no inconvenience by its contact with the living tissues, which do not, consequently, resent its intrusion by taking on disease. The length of time during which the sojourn of such a substance may continue without the supervention of serious symptoms, is strikingly illustrated by several of the cases narrated in the present work. Louis,[1] for example, gives an instance in which, after the first few minutes, the patient did not experience a bad symptom for an entire year. At the end of that time he coughed up a cherry-stone, followed by such a copious expectoration that he died exhausted in three days. In a case mentioned by Dr. Struthers, of Scotland,[2] the only symptom, for three months, of there being anything amiss in the chest was the occasional occurrence of a slight cough and wheezing, resulting, most probably, from simple irritation of the mucous membrane, and from the substance becoming loose in the air-passages. At the distance even of fifteen months, so slight was the disturbance of the respiration, and so equivocal the evidence of the existence of an extraneous body, that several surgeons, among others Sir Benjamin C. Brodie, expressed the opinion that the case was one altogether of chronic cough, from which recovery might soon take place. It was not

[1] Memoir on Bronchotomy, in Memoirs of the Royal Academy of Surgery, translated by Ottley, p. 277, London, 1848.

[2] Dublin Medical Press, Nov. 1852.

until a month after the man had left London, and sixteen months after the accident, that the sputa became bloody and fetid, indicating that the disorganizing process had commenced in the lungs.

M. Renauldin met with a curious case in which a fragment of a nail was found in the lung, and yet no symptoms denotive of its presence had existed during life.[1]

Dr. D. F. Condie, of Philadelphia, author of the learned and excellent *Treatise on the Diseases of Children*,[2] mentions an instance where, upon dissection, a small glass ball, of the size of a large bead, was discovered deep in the right bronchus, the presence of which had not been suspected during life, owing to all absence of the symptoms which usually denote the existence of foreign bodies in the air-tubes. After the first day, there was a complete intermission of the dyspnœa, spasmodic cough, and every other phenomenon, the child continuing nearly a week free from all disease, except an occasional hoarseness and a short hacking cough. Gradually, however, pneumonia came on, and terminated fatally in five days. Upon inquiry, subsequent to the autopsy, it was ascertained that the bead, found in the right bronchus, had been given to the child to amuse him, on the day he was first attacked, and had been missed from that period.

A child was brought to Mons. Guersant,[3] of Paris, fourteen days after having inhaled a kidney-bean; the symptoms of suffocation occurred at intervals only, and for a few days the case was subjected to medical treatment merely in the belief that there was no foreign body in the air-passages. The operation was not performed until the eighteenth day after the accident. As soon as the trachea was opened, the bean appeared at the wound, and was immediately extracted. Complete recovery was the result.

An instance similar to the preceding occurred, some years ago, in the practice of Dr. Kreider, of Ohio. The patient, a child, had swallowed a grain of corn. The symptoms were those merely of laryngeal irritation, and no one had suspected the existence of the foreign body until three weeks after the accident. Tracheotomy was immediately performed, and was followed by prompt recovery.[4]

[1] American Journal of the Medical Sciences, N. S. vol. i. p. 231.

[2] Third edition, p. 366, 1850.

[3] Provincial Medical Journal, April 16, 1842; Philad. Med. Examiner, N. S. vol. i. p. 463, 1842.

[4] Dr. Drake, in Western Journ. of Med. and Surgery, vol. iv.

In a case narrated by Royer Collard,[1] a French Physician, the foreign body appears to have lain in a state of latency for a long period. The patient, a lunatic at Charenton, in eating a mutton-chop, accidentally drew into his windpipe a piece of bone, which remained in the parts without producing any severe symptoms, or even inconvenience, for six years. At the end of this time the man died, without, however, any apparent pectoral disease. On dissection, the bone was found impacted in the left bronchus; but the structures around exhibited no morbid alterations. Another case, likewise that of a maniac, is given by the same author, in which a nail, an inch and a half long, with a large head, was retained in the air-passages for, as was supposed, two or three years, without the occurrence of any pulmonary symptoms. The patient, however, sunk at last, after an illness of a fortnight, under hectic fever, cough, and copious expectoration. The nail was discovered in the left bronchus, very much oxidized and covered with animal matter; the mucous membrane around was thickened, and the lung was filled with tubercles, most of them in a softened state.

2. *Cough.*—The character of the cough is usually spasmodic, that is, sudden, short, and uncontrollable, lasting from a few seconds to several minutes, half an hour, an hour, or even several hours. Sometimes, although protracted, it is comparatively mild, while at other times it is so severe as to be attended with great exhaustion. During the existence of the cough the patient frequently experiences a sense of tickling in the throat with more or less soreness and even pain in the respiratory tubes and at the top of the sternum; the countenance becomes suffused and frequently even livid; and the brain is oppressed by a determination of blood. In violent and protracted efforts of this kind there is sometimes a discharge of blood from the nose and mouth.

The *sound* produced by coughing is sometimes very peculiar. In a case reported by Mr. Luke,[2] of London, it resembled the sudden and violent click of a valve, and gave one the idea of a large globule of mucus being very suddenly stopped in its progress upwards by the closure of the rima of the glottis. It was attended, as the patient, a boy aged nine years, stated, by a feeling of suffocation, and was always heard in the direction of the larynx. The

[1] Nouvelle Bibliothèque Médicale, t. 1, pp. 196–200; Feb. 1826.

[2] London Medical Gazette, vol. xxii. p. 296.

sound remained until the expulsion of the stone, and was remarkably loud and distinct during the coughing which succeeded the opening of the trachea. In a case narrated by Dr. Jewett, of St. Johnsbury,[1] Vermont, the cough, for a short time, resembled the barking of a fox. It should be observed, however, that this peculiarity was not noticed until nearly a month after tracheotomy had been performed.

Sometimes the cough is of a croupish character. This was the case in a considerable number of instances cited in this work. When this peculiarity is present, it may be very difficult to ascertain the true nature of the affection, or to determine whether the symptoms really depend upon croup or upon the existence of a foreign body.

The cough, after having existed for a short time, may disappear, and never recur. Mr. Cæsar Hawkins,[2] of London, met with such a case in a girl, aged twelve years, who, while taking some soup, inhaled a piece of mutton-bone. Violent coughing with vomiting immediately supervened, but these symptoms lasted only a short time, and never returned, leaving the patient with a noise in breathing, and a fixed pain beneath the cricoid cartilage. Tracheotomy was performed on the day after the accident, and the offending body extracted with a pair of forceps from the lower part of the larynx.

The cough is occasionally influenced by the patient's posture. Thus, he may be perfectly free while sitting up, or lying down, but the moment he rises, or moves his body, he may be seized with a violent paroxysm. In a case recorded by Mr. Gilroy,[3] of a woman, forty years of age, who was suffering under pulmonary disease, caused by the lodgement of a chicken-bone in one of the bronchial tubes, this phenomenon existed in a very striking degree. As long as she remained perfectly quiet, with her shoulders depressed, she was free from cough; but as soon as she raised herself in the least, or turned on either side, a violent attack came on, which she could always excite at pleasure, by placing herself in the first-mentioned position.

3. *State of the Voice.*—The voice is variously affected. In most instances it is natural, or so nearly in that condition as to render it difficult, if not impossible, to detect the change. Occasionally, how-

[1] Boston Medical and Surgical Journal, vol. xvi. p. 90, 1836.

[2] London Lancet, vol. i. p. 801, 1839–40.

[3] Edinburgh Medical and Surgical Journal, vol. 35, p. 294.

ever, it is altered in a very remarkable manner, both as it respects its quality and capacity. Sometimes it is croupy, or hoarse and low, while at other times it is sharp and sibilant. Cases occur in which, in consequence of the morbid action produced by the foreign body, it sounds as if it were cracked, or broken. Sometimes, again, it is reduced to a mere whisper; and now and then, but this is rare, it is entirely extinct, as in the instance mentioned by Dr. C. Bannister,[1] of Phelps, New York. In this case a child, aged two years and a half, had inhaled a piece of brass metal, which gave rise to a total loss of voice, which continued for six weeks, but promptly disappeared after the expulsion of the foreign substance.

Loss of voice, either wholly or in part, is most apt to take place when the foreign body is lodged within the larynx or the superior portion of the trachea. The following cases are examples of this occurrence.

Dr. O'Reilly,[2] of New York, performed laryngotomy upon a man, aged thirty, on account of a sixpence impacted in the left ventricle. Loss of voice existed from the moment of the accident until the expulsion of the coin at the end of the twenty-sixth day, when it instantly returned, the patient loudly exclaiming: "I have swallowed it." Dr. Mussey,[3] of Cincinnati, met with an instance in a youth of fifteen, who could not speak above a whisper after the accident. The larynx was freely opened, and the foreign substance, a cocklebur, extracted from the sinus of Morgagni; but the voice remained absent until the twenty-first day after, when it suddenly returned while the lad was scolding his servant.

Alterations of the voice, of whatever nature, degree, or extent, may happen immediately after the accident, or they may not appear until after the lapse of some time, that is, not until the foreign body has had time to cause irritation in the vocal chords. Sometimes the power of speech is temporarily lost, and then returns, either suddenly or gradually, without any assignable cause.

4. *Flapping Noise.*—In a case related by the younger Mr. Travers,[4] of London, of a girl aged six years, who had inhaled a cherry-stone, some of the attendants stated that the foreign body, in its ascent and descent along the trachea, made a distinct flapping or rattling

[1] Boston Med. and Surg. Journal, vol. xxxvi. p. 142.
[2] Reese's New York Medical Gazette, vol. iii. p. 224.
[3] Transactions of the Amer. Med. Association, vol. iii. p. 362.
[4] London Medico-Chir. Trans., vol. xxiii. p. 114.

noise, likened, on one occasion, to the sound of a stone shaken violently in an earthen jar. Mr. Travers, in commenting upon this circumstance, very justly observes, without seeking to deny its validity, that such sounds are often delusive, and that all the evidence in the present instance was opposed to the belief that the substance was able to move to and fro in the windpipe. The case, however, seems to derive confirmation from one of croup, alluded to by this gentleman, and narrated by Dr. Farre, in the third volume of the *Medico-Chirurgical Transactions* of London, in which the mother distinctly recognized a "flip-flap" noise at every respiration. It seemed to her as if something was raised in the trachea every time the child breathed. Might this not have been a piece of false membrane, partially detached, and playing about in the tube? Mr. Bransby B. Cooper,[1] asserts that there is almost always in these accidents a flapping noise over the cricoid cartilage, discernible by placing the ear upon that structure, and produced by the foreign substance striking against the rima of the glottis. He gives only one case, however, in which this peculiarity really existed, and hence I am inclined to regard the statement as purely conjectural.

5. *Expectoration.*—Much difference is observed in the character and quantity of the expectoration in this accident, depending very much upon the nature of the foreign body, its situation in the air-passages, and, above all, upon the period of its sojourn. Under ordinary circumstances, the fluid is of a thin, sero-mucous appearance, and varies in quantity from a few drachms to several ounces in the twenty-four hours, according to the frequency and violence of the cough, and the amount of irritation of the lining membrane. Not unfrequently the discharge is very thick and ropy, more or less opaque, and remarkably abundant. In protracted cases, it is generally muco-purulent; and sometimes it appears to consist almost entirely of pure pus. Occasionally it is tinged with blood, or of a dirty rust-colored aspect.

When cavities form around the foreign body, whether in consequence of suppuration, gangrene, or the softening of tubercular matter, the expectoration may be almost insupportably offensive. In a case related by Dr. Struthers, of Scotland, of a man, aged twenty-one, who died of gangrenous abscesses of the right lung, four years and a half after having inhaled a piece of bone,

[1] Lectures on Surgery, p. 351. Phila., 1852.

the fetor was so great that he was compelled to abandon his business, for which he was otherwise well qualified. I am not inclined to place much diagnostic value upon this occurrence, since it may be produced by various other causes; but it is proper to observe that the late Mr. Liston thought he could thus detect the presence of a foreign substance. I shall have occasion to revert to this subject under another head.

When the expectoration is very profuse and of a purulent character, it is very apt to lead to rapid emaciation and exhaustion, the symptoms being such as usually attend pulmonary phthisis. Nevertheless, it is surprising how long some individuals will live under such circumstances. In some of the cases described in this treatise, life was prolonged for a number of years. In one of my own cases the patient survived nearly twelve months, although he was incessantly harassed by cough and night-sweats, and expectorated daily from a pint and a half to a quart of thick, fetid matter.

6. *Discharge of Blood.*—Sometimes the patient throws up blood, usually mixed with frothy mucus, but occasionally quite pure, and of a florid, dark, or purple color. The quantity is usually very small, not exceeding a few drachms; now and then, however, it amounts to several ounces, and when this is the case, it is always a source of serious alarm to the patient. The hemoptysis may occur immediately after the introduction of the foreign substance, as happened in several of the cases recorded in this monograph; or it may not take place until some hours, days, weeks, months, or even years after; in fact, not until serious structural changes have taken place in the lungs, in consequence of the irritation set up by the extraneous body. When sudden and copious, the blood may proceed from the rupture of a tolerably large vessel; but most generally it may be supposed to be the result of a process of exhalation, or of the rough contact of the intruding substance, as it is impelled against the inflamed mucous membrane of the air-passages during severe paroxysms of coughing. However induced, it is a phenomenon of little importance, as it does not indicate any particular danger. In none of the cases detailed in this work was it a cause of death, or even of much prostration.

Mr. John Howship, in his *Practical Observations in Surgery*, records the instance of a man, aged sixty-five, who labored constantly, from the beginning of the accident up to the time of the ejection of the foreign body, a period of nearly four months, under spitting of

blood and hemoptysis. In a case mentioned by Mr. South,[1] of London, as having occurred in the practice of Mr. Sutton, of Greenwich, the patient had frequent attacks of hemoptysis for more than a twelvemonth, from each of which, however, he rapidly recovered. The foreign body was a lathe nail, which was finally ejected in a violent fit of coughing, but death occurred some years after from disease of the lungs. Dr. Struthers,[2] of Scotland, gives an instance in which the loss of blood occasionally amounted to half a pint at a time. It continued for several years, and was conjoined with bloody expectoration.

It is not improbable that the nature of the foreign body may exert some influence upon the production and maintenance of the hemorrhage in these accidents. It is worthy of remark that in the cases observed by Howship and Sutton, the extraneous substances were iron nails. In that of Dr. Struthers, in which the loss of blood was frequent and copious, and continued for several years, the foreign body was a small piece of bone, of an irregularly elongated form, with several sharp spicula.

7. *Pain.*—The next symptom to be noticed is the *pain* which attends this accident. This also, as a matter of course, is subject to much diversity, depending upon various circumstances, some of which it is not always possible to appreciate.

It is worthy of remark that pain does not always follow the introduction and lodgement of a foreign body in the air-passages, and that, when present, it varies much in degree as well as in character. Generally speaking, it is very slight, while sometimes it is excessively violent. It may come on at the moment of the accident, or it may not show itself until some time after, perhaps not until the resulting inflammation has produced serious structural lesion. In its character, it may be sharp and pricking, or dull, heavy, and aching; it may be limited to the seat of the foreign body, or it may pervade the trachea, larynx, bronchial tubes, and even the lungs; nay, it may even extend to the throat, œsophagus, and muscles of the chest. It is generally accompanied with a sense of constriction, tightness, or suffocation, and is liable to be aggravated whenever the patient coughs, or whenever there is the slightest change in the situation of the foreign body. It may also be stated, as a general

[1] Chelius's Surgery, vol. iii. p. 112. Phila., 1847.
[2] Dublin Medical Press, Nov. 24, 1852.

rule, that the pain will be greater when the foreign substance is large and rough than when it is small and smooth.

In a case mentioned by Dr. John Browne,[1] of Dublin, of a child, about four years of age, into whose right bronchus a piece of delft had been forced, there was a fixed pain in the upper part of the thorax on the right side, a little below the level of the first bone of the sternum. The parents would not permit an operation, and the patient expired on the third day. Mr. David Johnston, Surgeon to the Royal Infirmary, at Montrose, had a case in which the patient, aged fifteen, complained of acute pain in the trachea, about an inch above the top of the sternum, where he supposed the foreign body, a piece of nutshell, was originally arrested, though the symptoms seemed to denote that it had afterwards descended into the left bronchus. It was increased by pressure, and was accompanied by a sense of constriction in the chest, and pain in the neighborhood of the left nipple.[2] In a case narrated by Louis,[3] the child referred the pain to the trachea, midway between the larynx and sternum, where the foreign substance was found after death, and extracted with a pair of forceps. M. Lescure gives an instance where the pain never varied in its situation from the moment of the accident until the ejection of the substance ten months after. On dissection, a small cavity was found in the left lung, about four inches below the trachea, in which the foreign body had evidently been impacted during all this time.[4]

The pain occasionally remains fixed for a long time at one spot, and then suddenly shifts to another. The following case, related by Sue, strikingly confirms the truth of this remark: A girl having let a pigeon bone slip into her windpipe, complained of pain for seven years in the superior part of the trachea, just below the larynx. At the end of this period it left this situation, and located itself at the upper part of the chest.[5] The patient finally died phthisical seventeen years after the accident, and eighteen months after the expulsion of the foreign body.

The pain appears to be most apt to become fixed when the

[1] Edinburgh Med. and Surg. Journ., vol. xxv. p. 286. Foot note.

[2] Philadelphia Medical Examiner, New Series, vol. viii. p. 193.

[3] Second Memoir on Bronchotomy, in Memoirs of the Royal Academy of Surgery of France, by Ottley, p. 257. London, 1848.

[4] Mém. de l'Académie Royale de Chirurgie, tom. v. p. 354.

[5] Edinburgh Med. and Surg. Journ., vol. xxxv. p. 284.

foreign body is impacted, or immovable. A boy, aged eleven years, who had inhaled a piece of wood, and whose case is narrated by Mr. McNamara,[1] of Dublin, complained for four weeks of pain low down in the right lung. At the end of this time, in a violent fit of coughing, the pain suddenly left him, and, upon examining his chest, the foreign body could be detected moving up and down the trachea. In the case of Dr. Webster,[2] of London, the patient, a lad, fourteen years of age, complained constantly, especially during the first few weeks, of a darting pain under the sternum, extending towards the left side, where the foreign body was undoubtedly impacted. Sir Benjamin C. Brodie[3] mentions an instance, that of Mr. Brunel, the celebrated English engineer, in which the pain existed, for a time, in the right side of the chest, at a spot corresponding to the inferior extremity of the right bronchus.

Sometimes the pain remains at its original site long after the extrusion of the foreign substance. Mr. Howship,[4] of London, gives the case of an individual who had drawn an iron nail into his windpipe, which he ejected nearly four months after in a violent fit of coughing. During all this time he complained of a fixed pain in the right lung, confined to one particular spot. The patient recovered, but was subject for many years to cough, with slight hæmoptysis, and pain in the old situation.

In a case under the observation of Mr. Cock,[5] of London, in which a sixpence slipped into the throat, and lodged in the larynx, the patient suffered great pain and irritation, which he referred to this situation, where he was certain the coin was arrested. Shortly after the accident, the sixpence left the larynx, and descended into the trachea, followed by instant abatement of all the previous urgent symptoms. He, however, still coughed almost incessantly, said that he could feel the substance move up and down the windpipe, and now complained of pain and soreness in the direction of the right bronchus, and also just below the larynx.

Instead of pain, the patient sometimes experiences a feeling of *soreness*. This may occur at various points of the respiratory appa-

[1] Dublin Hospital Reports, vol. v. p. 598.

[2] The London Medical and Physical Journal, vol. lvi. p. 430, 1826.

[3] Medico-Chirurg. Trans. of London, vol. xxvi. p. 287.

[4] Practical Observations in Surgery. London, 1816.

[5] London Medical Gazette, vol. i. New Series.

ratus, and is, perhaps, more frequently present than the practitioner is aware, owing to the want of a thorough examination, or the fact that the patient is not always able to indicate the nature of his suffering.

This symptom was present in a number of the cases herein mentioned. In Professor May's[1] case, the soreness was situated in the trachea, which was so tender that the child, a boy, five years old, evinced much distress whenever this part was touched with the finger. The foreign substance, a grain of corn, could be distinctly heard and felt to strike with considerable force against the tube at every expiration.

8. *Respiratory Functions.*—It is hardly to be supposed that a foreign substance should enter the air-passages, or remain there for any length of time, without giving rise to more or less disturbance of the respiratory functions. Such is the exquisite sensibility of the mucous membrane of these tubes that no substance, however small or bland, can come in contact with it without inducing cough and embarrassment of breathing. We have already seen how the chest heaves, and the sufferer struggles for air at the moment of the accident; how livid his features are, how his eyes protrude from their sockets, and how wildly he stares about him for relief, expecting every moment to be suffocated. The patient has hardly escaped from the immediate effects of the accident before his life is endangered by the inflammation which is developed by the presence of the foreign body, and which, if not promptly subdued, may speedily prove fatal. This effect is always to be dreaded in every case, and devolves upon the attendant the absolute necessity of frequent examinations of the chest, both by auscultation and percussion.

It would be out of place, in a treatise of this kind, to do more than direct general attention to this subject; to enter into all the details belonging to it would far exceed the limits I have assigned to myself, and would be of questionable utility to the reader.

One of the most remarkable circumstances, in many cases of this accident, is that, while the patient can freely inspire, he finds it almost impossible to expire. This is particularly the case when the foreign body lies in one of the bronchial tubes, which may be thus almost completely closed up, neither allowing the air to enter nor to pass

[1] Amer. Journ. Med. Sciences. New Series. April, 1852.

out of it. Nevertheless, as the other canal remains free, inspiration may be carried on with considerable vigor, whereas every attempt to expel the air from the obstructed lung will be attended with great suffering and a feeling of exhaustion. If, under such circumstances, the ear be applied to the chest, the respiratory murmur on the affected side will be found to be either entirely inaudible, or but faintly appreciable, while on the sound side it will either be perfectly natural, or more or less puerile, and, perhaps, even characterized by various râles. Whenever such a state of things exists, the thorax will be found everywhere perfectly clear, on percussion; the reverse being, of course, the case when there is hepatization from disease, or excessive engorgement of the pulmonary tissues, as will necessarily happen, in nearly every instance, within a short time after the foreign body has reached the air-passages. Occasionally, the air, as it rushes by the foreign body, produces sounds so peculiar that they may be regarded as pathognomonic of the nature of the affection. This happened in a most interesting case observed by Mr. McNamara, of Dublin; and in another instance, under the care of the same gentleman, the noise was still more remarkable, resembling that produced by blowing through a whistle, the foreign substance being a plum-stone, perforated at the middle. These cases will be mentioned more in detail in the chapter on diagnosis.

Sometimes the symptoms assume an *asthmatic* character, as in the remarkable case of Dr. Nooth, who was so unfortunate as to inhale a shot, which was not ejected until about two years afterwards. During all this time he was constantly annoyed by difficulty of breathing, severe cough, pain in the chest, expectoration, and other distressing symptoms, which promptly disappeared on the expulsion of the extraneous substance.

Similar symptoms existed in one of my own cases, that of Mr. Deppen's child, described at length in another part of this volume. When I first saw this patient, upwards of seven months after the accident, the attack so closely resembled asthma that any physician, not acquainted with the history of the case, would have been induced to treat it wholly as such.

9. *Posture.*—One of the most singular effects which sometimes result from the presence of a foreign body in the air-tubes is the peculiarity of the patient's posture, or the position which he assumes to render himself comfortable. This phenomenon was present in a number of the cases. It is occasionally observed at a

very early stage of the affection, but generally it does not come until some time has elapsed, and occasionally it is postponed until a very late period.

As a general rule, it may be observed that the patient finds it most comfortable to maintain the erect or semi-erect posture; as soon as he attempts to lie down he is seized with an increase in the embarrassment of breathing, with a disposition to cough and a feeling of suffocation. During sleep he is consequently obliged to be propped up in bed, and not unfrequently he is compelled to take what sleep he may be able to obtain in a chair. Sometimes he rests best on his back, and sometimes, again, upon one side. In a case narrated by Dr. Jewett,[1] of St. Johnsbury, Vermont, the patient, a child three years old, lay constantly on the right side, with his head elevated by pillows. His coughing and breathing, however, were not quickly affected by posture. In Mr. Gilroy's[2] case, alluded to in another chapter, the patient was most comfortable when she lay perfectly quiet, with her shoulders depressed. As soon as she raised herself in the least, or turned on either side, a violent fit of coughing came on, which she could thus always excite at pleasure. In a case, treated by Dr. M. S. Perry, the patient, a boy, five years old, was never able to lie down in bed from the time of the accident until the expulsion of the foreign body, a water-melon seed, four months afterwards.[3]

In the case of Dr. Webster,[4] of London, the patient, for the first fortnight, could lie only on the left side; whenever he attempted to sit up there was immediately an increase of the dyspnœa and sense of suffocation, which were, throughout, such prominent symptoms. On the twentieth day after the accident, he could lie only on his back, feeling as if he should be choked whenever he attempted to move. Subsequently to this date, no mention is made of the patient's posture, though the reporter adds that the symptoms varied very little until the ejection of the foreign body, a piece of cherry-stone, at the expiration of the sixty-eighth day.

In a case recorded by Mr. Samuel Solly,[5] of London, the man

[1] Boston Med. and Surg. Journ. vol. xvi. p. 88, 1837.

[2] Edinburgh Med. and Surg. Journ. vol. xxxv. p. 294, 1831.

[3] Dr. J. B. S. Jackson's Descriptive Catalogue of the Anatomical Museum of the Boston Society for Medical Improvement, p. 119, 1847.

[4] The London Medical and Physical Journal, vol. lvi. p. 430, 1826.

[5] London Lancet, vol. i. p. 480; May 5, 1849.

was obliged to lie either on his back or right side. Whenever he attempted to turn on the left side he experienced great dyspnœa, with cough and impending suffocation. In an instance mentioned by the late Mr. Key, of London, in which an English sixpence was inhaled, the patient, a man aged thirty-five years, was unable to stoop, or lie with his head down, without exciting cough; and at such times he always experienced a sensation in his chest as if something were suspended there.

10. *Emphysema.*—It is not often that foreign bodies give rise to emphysema. M. Louis, in his celebrated Memoir, already several times referred to, was the first to notice this phenomenon, which has occasionally been witnessed since by other practitioners. The illustrious French surgeon appears to have met with it only once, but the case is so interesting and instructive that I shall take the liberty of condensing it for the benefit of the reader. It places the whole subject of this form of emphysema in a most striking light, and Louis in a most favorable position as a shrewd observer and an accurate pathologist.

The patient was a girl, seven years old, who, in playing with some kidney-beans, threw one of them into her windpipe. She was immediately attacked with difficulty of breathing and a convulsive cough, which greatly exhausted her. She suffered some pain in the trachea, midway between the larynx and sternum, and pointed to that spot as the place where the foreign body was lodged. Two days had elapsed when Louis was called to see her in consultation. He found her laboring under great dyspnœa, attended by a rattling noise in the chest and the expectoration of a frothy mucus. Having carefully examined the case, he went home to prepare for the operation of tracheotomy. He returned in two hours, when he found the child a little better, but well-marked emphysema now existed on each side above the clavicles, which was not present before. The operation was resisted by the parents, and the patient died three days after the accident.[1]

"It was the presence of this emphysema," says Louis, "which, more than all my arguments, led to the general conviction that the bean was in the trachea. I do not think that any of those who witnessed the case had a clear idea as to the mode in which this symptom arose. It might be supposed that the foreign body, by

[1] Memoir on Bronchotomy, in *op. cit.* p. 257.

the obstacle it had offered to the free passage of air for eight-and-forty hours, had led to the laceration of the membrane uniting the rings of the trachea. The examination of the body, however, served to dispel this illusion. The tumor had not originated in the neighborhood of the trachea. This merely formed the boundary of the emphysema; the body of the lung and the mediastinum were emphysematous. The retention of air caused by the foreign body, in each movement of expiration, and especially in the fits of cough, produced a violent impulse of the elastic fluid towards the surface of the lung, and into the spongy tissue of the organ; it then passed into the cellular tissue uniting the lung to the pleura which covers it, and, passing from one cell to another, prodigiously distended the cellular tissue, separating the layers of the mediastinum, and finally exhibiting itself above the clavicles. This distension of the lung and of the neighboring parts by the air, which had insinuated itself into the spongy and cellular tissues, was one very manifest cause of the suffocation; and this swelling seems so natural an effect of the presence of a foreign body in the trachea that one can scarcely believe but that it is a necessary symptom, though not alluded to by any author."[1]

Dr. James Copland[2] met with an instance, in a child upwards of eight years of age, in which the emphysema was above the clavicles; and several similar cases are mentioned in different parts of this monograph. On the whole, however, the occurrence, as was before intimated, is very rare.

11. *Headache.*—Patients laboring under foreign bodies in the windpipe are liable to suffer from headache, owing to the frequent determination of blood to the brain, and the violence with which this fluid is impelled against the delicate fibres of this organ. The amount of pain thus induced will necessarily vary in different cases and under different circumstances. Old persons, and such as are habitually predisposed to cerebral congestion are, probably, more likely to suffer in this way than the young and those who have naturally only a moderate quantity of blood. Occasionally, though rarely, the violent coughing and straining, consequent upon this accident, have produced apoplexy.

12. *General Health.*—The general health is variously affected;

[1] *Op. cit.* p. 274.

[2] Dict. of Practical Medicine, by Dr. Lee, vol. ii. p. 804; New York, 1846.

sometimes slightly, sometimes severely, and sometimes, again, not at all. In most cases, however, even in those in which the foreign substance is not retained beyond a few days, the system is apt to become feverish, and the patient suffers from want of appetite and sleep, attended with an anxious expression of the features. If the irritation continues, inflammation of the lungs and air-tubes soon takes place, with an aggravation of the cough, emaciation, and loss of strength. In a remarkable instance, mentioned by Louis, the patient, although subject to hæmoptysis and a variety of pulmonary symptoms, retained her *embonpoint* until the age of twenty-four, when she began to decline rapidly, and died several years after, having in the interval ejected the foreign body. This case is, of course, an exception; for, under such circumstances, the general health usually suffers very much, the symptoms being, in every respect, similar to those which attend phthisis.

In a case reported in the *Provincial Medical and Surgical Journal*, a British periodical, for September 1843, the patient, although she recovered her health, never attained her full development, the body always remaining stunted. The foreign substance, a beech-nut, was spontaneously ejected, in a fit of coughing, after having caused much suffering for nine years and a half, having been inhaled in early childhood.

CHAPTER V.

DIAGNOSIS OF FOREIGN BODIES.

SECTION I.

GENERAL OBSERVATIONS.

Although the symptoms which denote the intromission and presence of a foreign body in the air-tubes are, in general, sufficiently well-marked to enable us to arrive at a satisfactory conclusion regarding the true nature of the accident, yet occasionally the most thorough examination of the patient and the most minute inquiry into the history of the case fail to afford the requisite light for the formation of a correct opinion. Such a state of uncertainty is always to be deeply lamented, for it is not only a source of great and painful embarrassment to the practitioner, but it may be, and indeed often is, followed by the worst consequences to the poor sufferer, inasmuch as it prevents the prompt employment of the means which are necessary for his safety and relief. It is for this reason that every case, involving the question of the presence of a foreign body in the air-passages, should be most carefully investigated at the earliest possible moment, in order that no time may be lost in applying the proper treatment, and thus obviating the risk of suffocation, from the long and mischievous sojourn of the obnoxious substance in structures so essential to the well-being and the life of the individual. The rule, in all cases of this kind, is to act in the most prompt and efficient manner, on the well-known principle that, although the foreign body may not immediately prove fatal, yet the longer it is retained in the parts the greater will be the probability that it will ultimately destroy the patient, by keeping up an amount of irritation, the effects of which the respiratory apparatus and the system at large cannot permanently resist. I have

repeatedly experienced this state of uncertainty, and have no doubt it has often been felt by others.

These accidents occur most frequently in infants and children, who can but ill express their feelings; and hence one of the first duties, on the part of the practitioner, is to inquire, most carefully and circumstantially, into the history of every case that is brought under his observation. Very frequently some time elapses before he can reach the patient, or it may be that, although the interval between the occurrence and his visit may be very short, the first symptoms may have entirely disappeared, and the patient act and feel as if nothing had taken place. Now, it is just in such cases as these that the errors in question are most liable to happen; for the reason that the professional attendant, seeing that there is apparently nothing the matter, allows his mind to be lulled into a state of security, frequently not less injurious to himself than destructive to his patient. It is generally different with adults, who are usually conscious of the time and manner of such accidents, and who, therefore, rarely fail to give a correct account of them.

If the patient, supposing him to be a child, has been playing with a grain of corn, bean, pebble, or similar body, and has been suddenly seized with symptoms of suffocation, violent spasmodic cough, lividity of the face, pain in the upper part of the windpipe, and partial insensibility, the presumption will be strong that the substance, whatever it may have been, has slipped into the air-passages, and is the immediate and only cause of the suffering which the surgeon has been sent for to relieve. The presumption will be converted almost into positive certainty if the person was just previously in the enjoyment of good health; if he was romping, jumping, or laughing at the moment of the accident, with the substance, perhaps, in his mouth, or while attempting to throw it into that cavity; and especially, if the symptoms, after having been interrupted for a few minutes, continue to recur, with their former, or even with increased intensity, at longer or shorter intervals. The symptoms here enumerated, however, are sometimes, it must be confessed, most painfully simulated by the cough and embarrassment of breathing occasioned by cold and other affections. The difficulty in arriving at a correct diagnosis is still further augmented, in some of these cases, by the coincidence of the respiratory trouble and the fact of the child, at the moment of the seizure, having been engaged in playing with a substance such as that above mentioned. An

instance of this kind, in which this uncertainty existed in a very painful degree, fell under my observation in the autumn of 1850, at Portland, near this city. A little son of Mr. Ferguson, of that village, between three and four years of age, while amusing himself in the attic with several of his comrades, was suddenly attacked with a severe cough, croupy state of the voice, and difficulty of respiration, which were all ascribed to the inhalation of a grain of corn, several ears of which had been observed only a short time before in their hands. Dr. Knight and Dr. Chenoweth were sent for, with a request that I should accompany them to perform tracheotomy, provided this should be deemed necessary. Upon our arrival, finding that the symptoms had somewhat improved under the influence of a dose of syrup of squills, aided by warm drinks, and that the sufferings were not particularly urgent, it was concluded to treat the case as one of ordinary cold. Next morning the child was greatly relieved, and in a short time he was completely well. Coupling the symptoms in this case with its history, especially the suddenness of the attack and the fact that the children had been amusing themselves with grains of corn, a less timid surgeon might have been induced to perform what would certainly have been, in this instance, a useless and improper operation.

In another case, which fell under my observation in the summer of 1852, and which was seen several times by Dr. T. G. Richardson, Dr. Thomson, and others, an infant, about six months of age, was also suddenly seized one morning, while in perfect health, with cough and suffocative symptoms, which were afterwards found, but not until I made the dissection, to have been occasioned by the presence of a grain of corn inhaled upwards of a month previously. The only person present at the time of the accident was a child, four years old, whose statements respecting its nature were so vague and contradictory as to be worthless. She declared, at first, that the little sufferer had swallowed a grain of corn, but upon being more closely questioned she denied the fact, and said she did not know what had caused the trouble. Careful and repeated explorations of the chest, by myself and others, failed to throw any real light upon the nature of the case, and as the parents, under the circumstances, were much averse to an operation, the child was treated upon general principles, with the effect already announced. This case, I doubt not, is a type of a thousand others, equally unfortunate in their results.

Important information may frequently be obtained, in these accidents, by a careful exploration of the chest by means of *auscultation* and *percussion*. This is particularly the case when the foreign body is situated in the lower extremity of the trachea, or in one of the bronchial tubes, where, especially if it be bulky, or pretty firmly impacted, it must necessarily affect, more or less seriously, the respiratory functions, and thus manifest itself by the alterations which it induces in the sounds of the lungs and chest. These alterations are always less distinct, and, indeed, not unfrequently entirely absent, when the extraneous substance occupies the larynx, or the upper portion of the trachea.

A stethoscopic examination, however, although generally useful, and, therefore, never to be omitted, does not always afford satisfactory evidence of the nature of the case. Of the truth of this fact my observation has furnished me with several instances, in none of which, notwithstanding the most careful and repeated exploration, could I determine the situation of the intruding body. The same result has occasionally attended the investigations of others. Thus, the late Mr. Hodgson, of Birmingham, well known as a most able observer, repeatedly examined the chest of a boy, six years old, who had inhaled the berry of a plant called the bladder-senna, without detecting anything unusual in the breathing. On the seventh day after the accident the child suddenly expired, and on inspecting the body the berry was found in the trachea, about one inch below the cricoid cartilage. In the case of Mr. Brunel, treated by Sir B. C. Brodie, the chest was repeatedly and most thoroughly examined, at various intervals and under various circumstances, by means of the stethoscope, and yet no difference was discovered in the respiration. But it is not necessary to adduce any further proof upon this subject; the fact is indisputable, and may be easily verified by a reference to the cases embodied in the present treatise.

Two circumstances may be mentioned as likely to occasion this result. In the first place the auscultatory signs may be masked by previous disease, or by disease awakened soon after the occurrence of the accident, as inflammation of the windpipe, lungs, or pleura; and in the second place, the patient, especially if a child, may offer such resistance, either by his movements or cries, as absolutely to prevent the possibility of a thorough exploration. It is a question which has not yet been solved by experience, whether, in the latter

case, the obstacle could not be promptly and effectually surmounted by the use of chloroform. It would have the effect of rendering the patient perfectly passive, and would thus afford an opportunity of exploring the chest in the most satisfactory manner. We administer chloroform in sounding the bladder for stone, and why should we not employ anæsthetic agents when we wish to ascertain the existence of a foreign body in the air-passages? I throw out this hint as worthy of serious consideration.

Some inference, too, of a diagnostic character, may generally be drawn from the nature of the *foreign substance*. Ponderous bodies, such as bullets, shot, metallic buttons, pebbles, and pieces of coin, will generally at once descend into the bronchial tubes, from which they will afterwards be unable to rise in the act of coughing, sneezing, or any other violent expiratory effort, as they are liable to do when they are of an opposite description. In some experiments originally performed by the late Mr. Aston Key, of London, and subsequently repeated by Sir B. C. Brodie,[1] and others, it was ascertained that a coin of the size of a sixpence or half-sovereign, dropped into the trachea after death, will almost invariably fall, by its own weight, into one of the bronchial tubes, generally the right; and the same thing, it may reasonably be supposed, would happen in the living subject.

If the foreign body be large, and at the same time very rough, angular, or spiculated, it will probably be arrested in the larynx or the trachea. The same circumstance will be likely to occur if it be long and narrow, as in the case of a needle, pin, nail, or fish-bone, unless it should happen to enter the glottis vertically, when it may at once fall into one of the bronchial tubes. A piece of the claw of a lobster has been found firmly fixed in the trachea, a little above the level of the top of the sternum. Several cases are mentioned in the tables in which cockle-burs were lodged in the bronchial tubes, though it is difficult to conceive how substances so rough and thorny could take such a course. In a child, operated upon by Professor Mott, a large shawl-pin, nearly two inches in length, was arrested in the trachea.

In some instances, as stated elsewhere, the foreign substance is capable of producing a peculiar noise, occasionally detectable even at a distance from the patient's body. This symptom was present

[1] Medico-Chir. Trans. of London, vol. xxvi. p. 294.

in several of the cases mentioned in the tables, but in none in so striking a degree as in that of Mr. McNamara, where the substance consisted of a perforated plum-stone.

No definite information can, I think, be derived from the state of the *voice* when the foreign body lies in the trachea or in one of the bronchial tubes. Under such circumstances, it may be more or less changed; or, in rare cases, perhaps, even entirely absent; but as the alterations are not peculiar, but altogether similar to those produced in ordinary affections of the air-passages, it is evident that they are of no diagnostic value. The reverse, however, is the case when the foreign substance is retained within the larynx; for then, as will be stated hereafter, the changes in the vocal functions, if not actually characteristic, may, in conjunction with other symptoms, afford most important, if not conclusive information.

The *pain* accompanying this accident cannot be regarded as diagnostic, inasmuch as it may be produced by other causes, as inflammation, neuralgia, or spasm of the air-passages. It has been already remarked that severe pain is sometimes experienced in the larynx when the foreign body is impacted in the bronchial tubes, and, conversely, in the bronchial tubes, or the inferior portion of the trachea, when it is lodged in the larynx. It is only when the pain is fixed at a particular spot in the chest, along with a perfect state of the voice, and the symptoms which usually denote the existence of a foreign substance in the air-tubes, that it can be considered as of any special moment; but even then it may be entirely deceptive. If, on the other hand, there is pain in the larynx, and the voice is absent, or materially changed in its character, the presumption will be strong, all other circumstances being equal, that the body has been arrested in that portion of the tube.

It has been pretended that the presence of a foreign body may be detected by the peculiar smell of the *expectorated matter;* which, as was stated in a previous chapter, is sometimes excessively fetid. The late Mr. Liston affected this faculty, but it is absurd to suppose that he possessed it any more than other men, at least as a general thing. On one occasion, in a gentleman who had a necrosed piece of cricoid cartilage in the trachea, he thought the fluid coughed up by the patient resembled that ejected when there is an extraneous body in the windpipe. The diagnosis, singularly enough, was verified by what actually occurred; for, about a week before the man died, he coughed up a piece of cartilage, and a very small fragment

of the same substance was found in the left bronchial tube at the *post-mortem* examination.[1] This was, of course, a mere coincidence; no one, not even Mr. Liston himself, had suspected the presence of a foreign body in the case adverted to, much less the fact that the patient had inhaled a portion of his own larynx.

The symptoms of extraneous bodies in the respiratory organs may be imitated by different diseases, either directly affecting these organs or acting upon them sympathetically. Of these diseases the most important are croup, hooping-cough, ulceration of the larynx and trachea, aneurism of the aorta, and worms in the intestines.

The symptoms produced by the presence of a foreign substance in the air-passages may be simulated by those of *spasmodic croup*. Allusion has been already made to this subject in a previous paragraph, and an instance adduced where it was impossible, owing to the imperfect history of the case, to determine the diagnosis. Generally, however, it is easy enough to distinguish between the two affections, by observing that in spasmodic croup the chief difficulty of breathing exists during inspiration, while in the case of a foreign body it exists during expiration. Important information may also be derived from the state of the voice, which is usually characteristic in croup, and from the state of the pulse and skin, which are rarely excited until after the extraneous substance has had time to cause inflammation and sympathetic irritation, whereas they are usually more or less seriously disturbed at an early stage in laryngeal disease. Besides, in the latter affection, the symptoms are continued, whereas in the case of a foreign body in the air-passage, there are frequent intermissions, followed by sudden aggravations of suffering.

Two very curious cases, bearing directly upon this subject, and for the particulars of which I am indebted to my friend Professor J. B. S. Jackson, of Boston, occurred some years ago in that city, in one of which an attack of membranous croup was mistaken for a foreign body in the air-passages, and in the other a foreign body for an attack of croup. As the cases are of great diagnostic interest, I subjoin a brief account of them.

The subject of the first case was a child from three to four years of age, who was attacked with dyspnœa while it was eating its dinner; stridulous breathing afterwards came on, and under these cir-

[1] London Lancet for 1850, vol. i. p. 78.

cumstances it was thought that some foreign substance had entered the air-passages. Dr. Lewis, of Boston, was called upon to operate, but declined, as the nature of the complaint did not seem clear to him. After some days the child died; and, on dissection, Dr. Samuel Cabot found all the evidences of croup, the membrane extending down into the smaller bronchial tubes.

In the other case, a little boy, five years of age, inhaled a watermelon seed, which he expelled at the end of four months, after having labored under symptoms of chronic laryngitis. He had been amusing himself in the garden, where, in consequence of exposure to cold, he was supposed to have suddenly contracted croup. So well convinced was the medical attendant that this was the fact, that the case was treated as if it had been one of that disease. The voice was very hoarse and shrill, the cough frequent and laryngeal, though not urgent, the respiration was slow, noisy, and laborious, and the child was never able to lie down in bed. The larynx was tender on pressure, and there was an enlargement of the neighboring lymphatic ganglions. The general health became gradually impaired, and the patient was passing rapidly into a state of marasmus, when, at the period above specified, the seed was suddenly expelled in a fit of coughing, followed by complete recovery.

Hooping-cough is another disease between which and this accident embarrassment may arise respecting the diagnosis. Under such circumstances careful inquiry should be made into the history of the case, especially the previous state of the patient's health, the presence or absence of thoracic disease on the appearance of the alarming symptoms, and the fact as to the existence or non-existence of hooping-cough in the neighborhood, or in other members of the family. The cough in pertussis, like that produced by the presence of a foreign substance, is intermittent, and also attended, when the malady is fully formed, with lividity of the countenance; but it has a peculiar hoop which constitutes its distinctive feature, and which is always wanting in the latter accident. Add to this the fact that the embarrassment of breathing is observed here, as in croup, not during expiration but during inspiration, and the practitioner will have little, if any, difficulty in coming to a correct decision respecting the true nature of the complaint.

Spasm of the glottis, by producing suffocation, may give rise to symptoms simulating those of a foreign body in the windpipe. A not uncommon cause of this is ulceration of the larynx. A patient

referred to by Mr. Arnott,[1] of London, was suddenly seized with great difficulty of breathing, threatening speedy dissolution; laryngotomy was performed, but the individual perished. The only disease found after death was a small ulcer a little below the cricoid cartilage. In another instance, the same gentleman saw the most alarming symptoms produced by two small ulcers in the trachea, unaccompanied by pulmonary disease. He found the patient sitting upright in bed almost suffocated, and in a few minutes she fell back apparently dead. Artificial respiration was carried on for a short time, and the woman did well, but she returned to the hospital at the end of two months, and died soon afterwards.

Now, should such an occurrence as the above take place while the patient is eating, it would be very natural to ascribe it to the presence of a foreign body in the air-passages, although these passages might be entirely free from mechanical obstruction of every kind. The diagnosis, in such an event, would, of course, be extremely difficult, if not impossible. The history of the case might furnish some clue, though hardly any of a satisfactory character. Upon whatever cause the symptoms depend, tracheotomy alone would be likely to save the patient, and, it need hardly be added, that it should be performed without the least delay.

Similar embarrassment may arise from an *aneurismal tumor* of the thoracic aorta. The pressure of such a tumor may, it is well known, produce great narrowing both of the trachea and of the bronchial tubes, particularly the latter, thereby seriously impeding the passage of the air to the lungs. The breathing, in such a case, will nearly always be decidedly stridulous, though occasionally there will be total extinction of the voice; there will also be more or less dyspnœa, with a sense of constriction in the upper part of the chest, and the respiratory murmur will be comparatively feeble on the affected side, while on the other it will be permanently and, perhaps, intensely puerile. When the occlusion is complete, a circumstance which, however, rarely happens, the corresponding lung will be in the same condition as in complete obstruction of the bronchial tube by a foreign body. The diagnostic signs, in cases of doubt, are the gradual approach and persistent character of the symptoms in aneurismal disease; and their sudden, violent, and intermittent character when occasioned by the presence of an extraneous substance

[1] London Lancet, vol. i. p. 803, 1839–40.

in the air-passages. Moreover, it is worthy of being borne in mind that such accidents are most frequent in children, while aneurism of the thoracic aorta is most common in elderly subjects.

The sympathetic irritation induced by *worms* in the alimentary canal, may closely simulate the phenomena produced by the presence of a foreign substance in the windpipe. It would be out of place here to speak of the symptoms occasioned by this class of entozoa when they inhabit this particular situation; it is well known that there is not one that is pathognomonic, and that they are all referable solely to irritation of the gastro-intestinal surface. This irritation, during its progress, is often reflected, especially in weakly, scrofulous children, and in young, delicate females, to other organs, causing the most Protean and singular phenomena. Epilepsy, chorea, hysteria, asthma, convulsions, amaurosis, and even mania are among the affections that have been repeatedly induced by worms in the alimentary canal. When the air-passages become sympathetically involved, the patient may have great dyspnœa, with a sense of constriction in the chest, wheezing, and almost incessant cough, painfully imitative of the symptoms of a foreign substance. On applying the ear to the chest bronchial râles may generally be detected, and sometimes even evidence of considerable congestion of the pulmonary tissues. In some cases these occurrences are persistent; but more generally they are intermittent; coming on in paroxysms, which, after having lasted a certain length of time, leave the patient free from cough and other suffering. The most certain diagnostics, in circumstances of doubt, are the history of the case, and the prompt relief which usually follows the exhibition of anthelmintic remedies, when the affection is of a verminous character; and the failure of these means, when the symptoms depend upon the presence of a foreign body.

There is but little reference made to this subject in any of the cases analyzed in this work. The most remarkable is that given by Dr. Enos Barnes,[1] of a child, aged seventeen months, in whom tracheotomy was delayed six weeks under the supposition that it was laboring under intestinal worms. Anthelmintics were employed, but without benefit; and when, at length, the operation was performed, the child was excessively emaciated and debilitated,

[1] New York Medical and Physical Journal, vol. vi. p. 78.

although it made a rapid recovery after having ejected, nearly two months after the accident, a pebble and several fragments of a bean.

It is difficult to conceive how a case of foreign body in the windpipe could be mistaken for one of *bronchocele*, and yet such an error seems to have actually occurred in practice. The case is mentioned by Reiche,[1] a German writer. The patient was a child affected with congenital bronchocele, from the effects of which it was supposed to have lost its life. Upon dissection, however, the real cause of death was ascertained to be a foreign body in the left bronchial tube.

It has been stated elsewhere that symptoms closely resembling those produced by foreign bodies in the air-tubes, may be caused by the lodgement and impaction of extraneous substances in the *pharynx* and *œsophagus*. This fact shows the importance of thoroughly examining, in all cases of doubt, the latter passages with the finger and probang before we attempt an operation for the relief of the patient, or before we rest satisfied that the obstruction is really in the windpipe. From the want of such precaution serious consequences may arise. Thus, in an instance referred to by Desault,[2] a surgeon, otherwise skilful, committed the error of opening the trachea, simply because he had neglected the use of the probang. All the signs of suffocation existed, along with great difficulty of deglutition. The operation was performed, but nothing was found in the windpipe. It was, therefore, natural to conclude that the extraneous substance had descended into one of the bronchial tubes. The man died, and to the astonishment of the surgeon it was discovered in the œsophagus.

The probang, however, should not be used indiscriminately; nor should it be introduced without the utmost care and gentleness, inasmuch as it may, when this precaution is neglected, cause very serious distress. In several of the cases analyzed in this work, the passage of this instrument came very nigh suffocating the patient.

Finally, it is well known that if a foreign body, such as a piece of meat, or cartilage, is retained even for a short time in the œsophagus or fauces, the irritation occasioned by its presence will often remain for hours, if not days, after its removal. Such is the distress sometimes, under these circumstances, that it is very difficult to persuade the patient that the substance is not still in its original

[1] Rust's Magazin, B. xxvii. S. 158.

[2] Surgical Works, translated by Dr. Smith, vol. i. p. 225, Philad. 1814.

situation. Now, the same thing may occur when the foreign body is in the windpipe; and hence, unless the practitioner is fully on his guard, he may be led into most serious error. Indeed, there is reason to believe that bronchotomy has occasionally been performed, under such circumstances, much to the detriment of the patient and the discredit of the surgeon. Mistakes will be most likely to happen when the suffering, instead of being spasmodic, as it generally is in the first instance, is of an inflammatory character, as evinced by the hoarse, stridulous, or croupy cough, the pain and tenderness in the throat and neighboring structures, the copious expectoration, the lividity of the features, the heaving of the chest, and the changes in the respiratory sounds. The practitioner, aware of the possibility of such an occurrence, will proceed warily, carefully considering the history of the case, and the mode of approach of the various symptoms. If the affection is purely spasmodic in its nature, it will generally soon disappear, either spontaneously, or under the influence of anodynes; if, on the contrary, it is inflammatory, leeches, blisters, purgatives, and antimonials will probably be required.

SECTION II.

DIAGNOSIS OF FOREIGN BODIES IN THE LARYNX.

It is not always easy to determine, from a consideration of the history and symptoms of the accident, whether the offending substance is in the larynx, or in some other portion of the windpipe. Our knowledge upon the subject, indeed, is far from being satisfactory. The only way in which it can be cleared up is to select the cases that have been reported, and to analyze them with reference to these points. For such an undertaking, however, we are hardly yet prepared; first, because many of the published cases make no mention of the circumstance; and, secondly, because, in a majority of them, no opportunity was afforded the practitioner of ascertaining the situation of the extraneous body, either during life, or after death. In looking over the numerous examples detailed in this work, it will be found that the state of the voice was noticed in comparatively few. A brief analysis, however, of these examples, will serve to throw some light upon the subject, if it will not definitively settle it.

The case of Pelletan,[1] the first that I shall mention, is one of the oldest of the kind on record. It refers to a man, aged twenty-four, who inhaled a button-mould, which lodged in the left ventricle of the larynx, and for the removal of which laryngo-tracheotomy was performed at the end of six weeks. The principal symptoms were a violent, harassing, and suffocative cough, which allowed the patient no rest, an habitual rhonchus, and a sense of distress in the region of the larynx. No mention is made of the state of the voice.

Professor R. M. Mussey,[2] of Cincinnati, had under his charge a lad of fifteen, who had got a cockle-bur, half an inch in length, into the ventricle of the larynx, from which it was removed with the finger, after the division of the cricoid cartilage, the crico-thyroid membrane, and the thyroid cartilage. The symptoms were, inability to speak above a whisper, pain and tenderness in the right side of the larynx, and paroxysms of great difficulty of breathing. The wound healed slowly, and the voice remained nearly extinct until the twenty-second day, when, in a fit of anger, in which the boy attempted to scold a servant, it suddenly returned with all its former power.

In a case by Mr. Orton,[3] a child inhaled a brass ring, about the size of a shilling, with a hole in the centre. It was retained nineteen days, causing occasional cough, attended with a croupy sound, and a whistling noise during sleep. Tracheotomy being performed, the substance was pushed up, through the larynx, in one of the ventricles of which it was supposed to have been lodged.

In a case observed by Dr. Burow,[4] a boy, aged twelve years, inhaled the larynx of a recently killed goose, which became entangled in his own. He was immediately seized with a sense of strangulation, which was gradually replaced by great dyspnœa. Eighteen hours after the accident, he had lividity of the countenance, spasmodic contraction of the muscles of the neck, and a clear, whistling sound in breathing, followed at each expiration by a hoarse noise, not unlike that of the voice of a goose. The trachea was opened, and the substance removed with the forceps.

In Dr. G. R. Morehouse's[5] case, a girl, ten years old, having in-

[1] Clinique Chirurgicale, t. i. p. 8. Paris, 1810.

[2] Trans. Amer. Med. Association, vol. 3, p. 363. 1850.

[3] London Lancet, vol. i. p. 247. 1852.

[4] Brit. and Foreign Medico-Chir. Rev. January, 1850, p. 260, Am. ed.

[5] Philadelphia Med. Examiner for April, 1852, p. 215.

haled a piece of almond shell, immediately experienced violent paroxysms of coughing, dyspnœa, and loss of voice, with a whistling sound, as of a person blowing through a quill. The breathing assumed an asthmatic character; there was pain, on pressure, at the lateral part of the larynx, and the respiratory murmur, although equal, was very feeble in both lungs. Laryngo-tracheotomy was performed, and the shell extracted from the left ventricle of Morgagni.

In a case communicated to me by Professor Van Buren, of New York, the patient, a boy, aged five years and a half, was immediately attacked with strangling cough, and severe dyspnœa. The day after the accident, the face was livid, the breathing stridulous, but equal on both sides, the respiratory murmur faint, the voice altered, and the cough frequent and croupy. The trachea being opened, the intruder, a piece of the claw of a lobster, was seized as it lay across the larynx, and extracted.

A child, seven years old, whose case was observed by Dr. T. G. Geoghegan,[1] having drawn into her windpipe the molar tooth of a dog, three-quarters of an inch long by three-eighths of an inch in breadth, was instantly seized with coughing and dyspnœa, attended with difficulty of swallowing, and pain and rattling in the upper part of the larynx. Two hours and a half after the occurrence of the accident, when the trachea was opened, the patient was in momentary danger of suffocation. As the foreign body could not be seized, Dr. Geoghegan introduced a canula, which greatly relieved the breathing. In the middle of the night, a sharp, clicking sound was heard at the wound whenever the child swallowed, and, on pressing the canula backwards, it was observed to strike against a hard substance, supposed to be the tooth. Subsequently, the noise disappeared, probably from a change in the location of the foreign body, which was removed from the larynx thirty-six hours after the operation. No mention is made as to the state of the voice.

The case of Mr. Duncan[2] is a very satisfactory one. A man, having got an English shilling into the windpipe, was immediately attacked with violent coughing and excessive difficulty of breathing, the latter of which continued for some minutes, and then gradually passed off. An hour after the accident, the voice was reduced almost to a whisper, and the man felt as if there were a valvular

[1] Dublin Med. Press, January 24, 1849.

[2] Northern Journal of Medicine for 1845.

substance in the tube, impeding the passage of the air. On compressing the larynx, he stated that he was perfectly convinced that the coin was lodged in the lower part of that cavity, opposite the cricoid cartilage. No unusual sound was detected on auscultation. The body being inverted and forcibly shaken, at the same time that the larynx was rapidly moved from side to side, the substance was expelled, and the voice immediately began to improve.

Desault[1] attended a man who died of phthisis two years after having inhaled a cherry-stone. He was seized immediately after the accident with a convulsive cough, difficulty of breathing, and sharp pain in the throat, with inability to speak, and distension of the jugular veins. After some hours, the symptoms abated, and then recurred at intervals, but with less severity. Having become habituated to the contact of the extraneous body, he merely experienced a sense of constriction on the left side of the larynx, on a level with the corresponding ventricle, in which, on dissection, the cherry-stone was found.

A man, attended by Dr. O'Rielly,[2] of New York, having drawn a sixpence into the left ventricle of the larynx, was instantly attacked with a paroxysm of suffocation and loss of voice, the former soon subsided, but the latter persisted until the extraction of the coin at the end of the twenty-sixth day, when it immediately returned. The vesicular murmur is stated to have been natural in both lungs. The breathing was very difficult, especially for the first few nights after the accident.

A man, twenty-five years old, was laryngotomized by Mons. Blandin,[3] of Paris, on account of a sewing-needle which had become entrapped in the larynx. The prominent symptoms were frequent cough, remarkable hoarseness, dysphagia, and almost entire aphonia. The parts about the larynx were much swollen, the integuments being red and painful. The operation was performed at the end of the fifth day, but the needle was not found until the next morning. Perfect recovery occurred, but the voice remained hoarse and feeble for several months.

Dr. W. H. Mussey,[4] of Cincinnati, met with an instance in a boy, aged seven years, who, immediately upon the inhalation of a piece

[1] Surgical Works, translated by Dr. E. D. Smith, vol. i. p. 222. Phila. 1814.

[2] New York Medical Gazette, vol. iii. p. 224. 1852.

[3] Journal Hebdomadaire de Médecine, No. 1. 1829.

[4] Western Lancet, November, 1853.

of bone into the larynx, upwards of three-quarters of an inch in length, by half an inch in width at its widest part, was seized with the most violent cough and dyspnœa, followed by inability to speak above a whisper, lividity of the face, and great debility. Laryngotracheotomy was performed twenty-two hours after the accident, but the bone was not ejected until three days subsequently. The voice was not fully restored until a fortnight afterwards.

In the Ephemerides of Natural Curiosities,[1] occurs the case of a child, who, having got a bean into the windpipe, became instantly affected with lividity of the face and the most violent cough, threatening strangulation, and followed by aphonia. A probang being introduced into the œsophagus, a small quantity of mucus was brought up, and immediately the patient recovered his speech. During the following night, he expired suddenly in a paroxysm of coughing; and, on dissection, the bean was found under the glottis. There can be no doubt that, in this case, the foreign body was originally situated in the larynx, whence it was forced into the trachea, or into one of the bronchial tubes, during the exploration of the œsophagus, and afterwards, in the fatal attack of coughing, again impelled into the larynx.

A negro boy, twelve years old, having inhaled a cockle-bur, immediately experienced a difficulty of respiration, attended with frequent coughing. Seen by Professor Dugas several days after, he spoke in a whisper, breathed and coughed as if he had œdema of the glottis, and pointed to the thyroid cartilage as the seat of soreness. The pulmonary sounds were natural, but a whizzing noise was heard on placing the stethoscope upon the larynx, from which the substance was subsequently extracted with the forceps.

In the case of a child, aged twelve months and a half, tracheotomized by the late Dr. Twitchell, of Keene, New Hampshire, the prominent symptoms were hoarseness, hissing respiration, dyspnœa, and dysphagia; the extraneous body, a piece of earthen cup, was impacted in the larynx, from which it was pushed into the fauces. Severe inflammation of the larynx supervened, causing excessive embarrassment of breathing, with complete aphonia, and high febrile excitement, notwithstanding which the patient recovered.

The following case occurred in my own practice, in a little negress, six years old, sent to me by Dr. Pendleton. In a diagnostic

[1] Decad. iii. ann. v. et vj. obs. ccliii.

point of view, it could not possibly be more satisfactory. The foreign body was a brass button, which, there is every reason to believe, was impacted in one of the ventricles of the larynx. The accident was instantly followed by a sense of suffocation, and a violent paroxysm of coughing, which gradually subsided, but recurred occasionally afterwards, until the substance was expelled. The voice was totally extinct, but after a few hours the child was able to talk in a whisper. No vesicular murmur could be perceived in either lung, but the chest sounded well on percussion, and, with the exception of the aphonia, there seemed to be nothing amiss when I first saw the child, a week after the accident. Tracheotomy being performed, the button was ejected in a few minutes in a fit of vomiting, followed instantly by a return of the voice.

In the above cases, sixteen in number, the state of the voice is mentioned in all, except three. In six, the offending substance was lodged in the ventricles; in four, in the left, and in the other two the precise location is not specified. In four of the cases, there was aphonia, and in the rest, the state of the voice is not indicated.

In ten of the cases, the extraneous body was situated in different parts of the larynx; in six of these there was aphonia, either partial or complete; in one, the voice was "altered," and in two, the state of the voice is not specified.

Cough is stated to have existed, as a prominent symptom, in eight of the cases. In four, it was violent; in two, croupy; in one, convulsive; and in one, frequent.

Distress in the region of the larynx existed in one case; pain and tenderness on the right side of the larynx in a second; in a third, pain at the upper part of the larynx; in a fourth, sharp pain in the throat, with a sense of constriction on the left side of the larynx; and soreness of the thyroid cartilage in a fifth.

The character of the respiration is mentioned in twelve of the cases. In eight it was more or less difficult, in a few excessively so; in one it was asthmatic, in one stridulous, and in one wheezing. A peculiar whistling sound in breathing was perceived in three of the cases; in one of these the substance was a brass ring, in another, the larynx [illegible] goose, and in the third, a piece of almond shell. In one instance, in which there [illegible] crackle-bur in the larynx, there was a whizzing sound in this tube. The vesicular murmur was noted in four of the cases; in one it was natural, in two, very faint, but equal in both lungs, and in the other, my own, it was entirely

absent, or so feeble as not to be discoverable by the ear. Dysphagia is mentioned twice.

From the above cases, few as they are, and imperfectly acquainted as we are with their histories, we may, nevertheless, conclude, as a general rule, that, whenever there is aphonia, whether partial or complete, the foreign body is situated in the larynx; at all events, there is a strong probability that this is the case, a probability which is converted into perfect certainty, if, conjoined with this symptom, there is pain, soreness, or uneasiness in the region of the larynx, along with dyspnœa, a whistling sound in respiration, absence of serious disease in the bronchial tubes and lungs, and inability, on the part of the observer, to perceive the offending body moving up and down the trachea.

It is important, however, in reference to this subject, to bear in mind that the voice may be seriously affected, and yet the foreign body not be lodged in the larynx. Thus, in the case of a child, brought to Dupuytren on the fifth day after it had inhaled a bean, there was complete aphonia, although the substance was perceived playing up and down the trachea, from which it was finally extracted by operation. The same remark is applicable to some of the other symptoms above enumerated. Thus, in a case by Mr. Liston, mentioned in one of the tables, in which a piece of bone was extracted with the forceps, there were, as the prominent phenomena, excessive dyspnœa, noisy and stridulous breathing, especially during inspiration, sharp pain in the larynx, and a raw feeling in the windpipe, and yet the intruder was impacted in the right bronchial tube. We shall have occasion, under another division of this subject, to allude to several examples in which a whistling sound was emitted by foreign bodies situated low down in the air-passages.

SECTION III.

DIAGNOSIS OF FOREIGN BODIES IN THE TRACHEA AND BRONCHIAL TUBES.

It has been seen elsewhere that when a foreign body descends below the larynx, it is usually arrested in one of the bronchial tubes, more frequently the right than the left. Under such circumstances, the respiratory murmur in the corresponding lung is gene-

rally more or less affected, as is evinced both by percussion and auscultation. The wall of the chest, however, is not, as might be supposed, always, perhaps not even generally, dull or flat, as in pneumonia and phthisis, in which the parenchymatous substance of the organ is condensed by abnormal deposits; on the contrary, the sound is frequently unnaturally clear and resonant, very much, indeed, as in pulmonary emphysema. This peculiarity is sometimes recognized over the entire lung; while at other times it is limited to particular portions, as one-half, a third, or one-fourth, according to the size and situation of the foreign body. When the extraneous substance is so large as to obstruct the bronchial tube completely, there must necessarily be marked dulness on percussion on the corresponding side of the chest, and great diminution, if not entire absence, of motion in the ribs; as I have repeatedly witnessed in the human subject and also in my experiments on the inferior animals.

The *respiratory murmur*, under the same circumstances, may be very much diminished, or wholly absent, according to the amount of the pulmonary obstruction. In most instances it is lessened only somewhat in intensity, because a certain quantity of air still enters the lung by the side of the foreign body. It is only when the extraneous substance is very bulky, or when the tube is completely closed by it, or partly by it, and partly by abnormal deposits, as mucus or lymph, that the respiratory murmur can be no longer recognized, or perceived only in the most imperfect manner. As might be supposed, this alteration in the sounds of the lungs varies not only in degree but also in extent, just as the sounds of the chest in percussion, according to the situation and extent of the obstruction. Thus it may be quite circumscribed, or limited to a very small portion of the lung, or it may pervade the entire organ. It is also worthy of remark that it is liable to vary in its site with the site of the foreign body upon the presence of which it depends. It has been already seen that the extraneous substance may change its place in consequence of the impulse which it receives during coughing, during violent expulsive efforts of the lungs, or even during the various movements of the body. I have myself several times witnessed this circumstance, so important in a diagnostic point of view. In one case under my observation the foreign body, a grain of corn, was impacted for upwards of a week in the right bronchial tube, when, all of a sudden, during a severe paroxysm of coughing, it changed its position, and passed over into the left, where it —

discovered on the dissection. Its former presence on the right side was denoted not only by the alterations in the respiratory murmur and the extraordinary resonance on percussion, but by the peculiar pathological appearance of the mucous membrane in the right bronchial tube. It should also be recollected that the changes in the respiration may be materially influenced, and even entirely masked, by the deposits produced by the irritation of the foreign substance; thus frequently divesting them of their diagnostic value.

The foreign body occasionally, perhaps, indeed, very frequently, *plays up and down the trachea*, either in consonance with the respiratory movements, or in consequence of severe fits of coughing. During these changes, it is very apt to cause severe spasm and irritation by impinging against the mucous membrane of the larynx, sufficient, in some instances, to induce suffocation. In many of these cases the patient is rendered conscious of this occurrence, not only by the pain and spasmodic cough, but by the peculiar sensation which the substance produces as it passes up and down the windpipe. In some instances, again, the extraneous body can be distinctly felt and even heard during these movements. This happened, among others, in the interesting case of Professor May,[1] of Washington City, narrated in another part of this work. The patient was a child five years old; and the substance, a grain of corn, could be distinctly heard and felt at every expiration as it struck the upper part of the trachea. In a case mentioned by Mr. Fergusson,[2] of London, the foreign body, a plum-stone, was most distinctly noticed when the thumb and forefinger were placed one on each side of the larynx; for then, if the patient was desired to cough, the impulse of the stone was felt as it struck the narrow part of the trachea above. The existence of the substance was more satisfactorily determined in this way than by auscultation. Dupuytren, Jameson, and others have noticed similar facts.

Allan Burns,[3] of Glasgow, was one of the first, if, indeed, not the first, to notice the tendency of foreign substances, under certain circumstances, to play up and down the windpipe. In his *Surgical Anatomy of the Head and Neck*, he refers to the case of a female who had inhaled a plum-stone, and in whom he observed this interesting

[1] Amer. Journ. Med. Sciences, New Series, April, 1852.

[2] Practical Surgery, p. 480, Phila. 1853.

[3] Surgical Anatomy of the Head and Neck, p. 413, Pattison's edition, Baltimore,

phenomenon. "I examined her carefully," he says, "and ascertained that while she was taking air into the lungs, the foreign substance descended with rapidity along the trachea, to the point where it bifurcates, from which, during expiration, it was again forced up into the larynx, but could not, by any effort, be projected through the rima. During its ascent and descent, it was productive of a tickling sensation along the course of the trachea." Mr. Burns died in 1813.

Occasionally, the *noise* produced by the foreign body, or, more properly speaking, by the air as it rushes past it, is so peculiar, that it may be regarded as pathognomonic of the nature of the accident. The following cases, which happened in the practice of Dr. McNamara, of Dublin, and which are recorded by him in the fifth volume of the Dublin Hospital Reports, not only happily illustrate this subject, but they afford an excellent idea of the stethoscopic signs of this accidental occurrence.

In the first case—that of a boy, four years of age, who had inhaled a plum-stone—the patient, after having recovered from the immediate effects of the accident, had occasional paroxysms of cough and dyspnœa, attended with great heaving of the chest, lividity of the countenance, and inability to expel the air from the lungs. Whenever the attacks were severe, Mr. McNamara could distinctly perceive that there was a mechanical obstruction to the exit of the air, occasioned by the ascent of the substance to the larynx, causing a perfectly audible sound, similar to that produced by striking the tongue forcibly against the anterior part of the hard palate, when the mouth is closed. The subsidence of the attack, moreover, was never marked by that deep and sonorous inspiration so characteristic of spasmodic cough. On the third day, the respiration, on the left side, was more puerile than natural, and associated with some sonorous râle superiorly; on the right side, on the contrary, there was an absence of vesicular murmur, while the chest everywhere sounded perfectly clear on percussion. "I kept the stethoscope applied," says Dr. McNamara, "to the right side of the thorax for about two minutes, when the boy made a sudden and violent effort at expiration, upon which the respiratory murmur, before inaudible, returned with an intensity equal to that of the left; and when he became tranquil, we could distinctly perceive a valve-like sound similar to that before described as occurring when the stone was pressed against the rima glottidis; in ad-

dition to this, a peculiar '*ronflement*' was heard on applying the stethoscope to the trachea, caused by the foreign body being moved upwards and downwards by the currents of air in that tube."

In the other case, the foreign body, also a plum-stone, had a hole in it, to answer the purpose of a sort of a "bird call." The patient, a little boy, was able to make a whistling noise, audible at a considerable distance, by forcibly expelling the air from the chest; but he could not produce any sound during inspiration. The breathing, three days after the accident, was perfectly natural, with the exception of a slight sonorous râle in the upper part of the left lung. Laryngotomy was now performed, and as the operation was followed by the subsidence of all the symptoms, it was concluded that the foreign body had passed into the fauces, and thence into the stomach. Nothing of consequence occurred for eight days, when, to the surprise of Mr. McNamara, the stethoscope detected an entire absence of respiration on the right side, while the vesicular murmur on the left side was more audible than natural, at the same time that the right sounded clear on percussion. From these circumstances, he had no hesitation in declaring that the stone was lodged in the right bronchial tube; a situation where, happily, it did not remain long, for, in a few minutes, on applying the instrument to the trachea, he perceived the peculiar *ronflement* before described, and which he regards as so characteristic of a foreign substance moving up and down that tube. In addition to this, the boy was now able to whistle, though very faintly, through the stone, and it was curious, continues the narrator of the case, to notice how this noise and the absence of the respiratory murmur alternated; for, whenever the substance was impacted in the right bronchial tube, he was incapable of producing the sound, and when he was able to whistle, the breathing in the right lung was natural. The diagnosis being thus clearly established, the previous wound was enlarged by dividing the superior part of the trachea, when the kernel was ejected in a fit of coughing.

Some years ago, a case occurred in St. Thomas's Hospital, London, in a boy into whose windpipe a four-penny piece had dropped and lodged, in the right bronchial tube. His chest was examined by several medical men, who distinctly perceived a peculiar sound, produced by the air as it passed on each side of the coin. This symptom was regarded as of sufficient importance to justify the

operation of tracheotomy, which was accordingly performed, with entire relief to the child.[1]

In another case, that of a child under the care of Mr. Orton,[2] of England, there was a distinct whistling sound, but only during sleep. The foreign body was a brass ring, about the size of a shilling, with a hole in the centre; it had remained in the windpipe nineteen days, the prominent symptom being an occasional cough, attended by a croupy noise, and the peculiar sound in question. Dr. J. G. Forbes,[3] of London, observed an instance in which there was, at first, a "cooing rhonchus," and, afterwards, a peculiar "whiff," or "puff," heard most clearly over the right bronchus, the third branch of which was the seat of a small piece of bone, inhaled by a woman forty-six years of age, and causing death at the end of the twenty-sixth day. These symptoms, together with the pain experienced in that situation, and the violent efforts made by the patient to expel it from thence, were the principal evidences which induced the professional attendants to believe that the foreign substance was lodged deeply in the lungs.

I do not, as was remarked elsewhere, recollect ever to have noticed, in this accident, the *flapping noise* described by the late Mr. Bransby B. Cooper.[4] This writer states that it is of general occurrence, that it may be heard by placing the ear over the cricoid cartilage, and that it is produced by the foreign body striking against the rima of the glottis, in its ascent from the bronchial tube. Mr. Cooper refers to a case in which this symptom was so distinctly marked that he was induced, without any other evidence, to perform tracheotomy. The patient was a boy, fourteen years of age, who had got a pebble into his windpipe. The sufferings, however, were so slight, and the stethoscopic signs so equivocal, that it was thought the stone might have been ejected in a fit of coughing, and that the irregular sounds might have depended upon the injury which the intruder had inflicted upon the mucous membrane of the windpipe. The next day, however, the flapping noise was heard so distinctly, both by Mr. Cooper and Mr. Addison, that an operation was at once determined upon. The trachea being opened, the pa-

[1] Cyclopædia of Surgery, vol. i. p. 511. London, 1841.

[2] London Lancet, vol. i. p. 247, 1852.

[3] Medico-Chirurg. Trans. of Lond. vol. xxxiii. p. 5, 1850.

[4] Lectures on the Principles and Practice of Surgery, p. 351. Phila. 1852.

tient was placed head downwards on an inclined plane, and in a few minutes the pebble fell into the hands of one of the assistants.

I should very much doubt the general, or even the frequent, occurrence of this symptom, and hence I should be inclined to place little confidence in it as a diagnostic sign. It is probable, moreover, that it may be produced by other causes, as by the air striking against a partially detached piece of false membrane, or against a mass of concrete mucus. In the cases analyzed in this treatise, allusion is made to this symptom only in one or two, and then merely incidentally.

The preceding facts will, I think, generally enable us to determine whether the foreign substance is firmly impacted in one of the bronchial tubes, or whether it is liable to move up and down the trachea during coughing and respiration. It may be assumed, from a careful examination of the cases mentioned in this treatise, that, in the great majority of them, the substance, whatever may be its character, continues to be movable within the canal in question. This is often true of cases even of long standing, but it is particularly so of recent ones, before the occurrence of much secretion, tending to attach the foreign body or impair its mobility, and before the development of serious structural lesion, as, for example, the formation of an abscess, in which the body may become, as it were, permanently imprisoned. When we add to the above facts the absence of all laryngeal disease, and the unaffected state of the voice, the conclusion will be inevitable that the intruder is lodged in one of the bronchial tubes, or alternately in one of these tubes and in the trachea.

I do not think that we are able to determine, from any facts that have yet transpired, when a foreign body is permanently arrested in the trachea. The number of such accidents is exceedingly limited, and the phenomena attending them have not been studied with sufficient accuracy to justify us in deducing from them any special conclusions. Mr. Cæsar Hawkins,[1] of London, has attempted to prove, by the citation of several cases, amongst others by one occurring in his own practice, that, when the extraneous substance is lodged high up in the trachea, or partly in the trachea and partly in the larynx, the nature of the affection will be evinced by the entire absence of cough, by the integrity of the voice, by the constant whistling sound in respiration, by the fixed soreness, pain, or

[1] Medico-Chir. Trans. of London, vol. xiiii. p. 105, 1840.

uneasiness at the seat of the obstruction, and by the ability of the patient to laugh, speak, and eat as if nothing had happened.

It must be confessed that the case adduced by Mr. Hawkins, from his own practice, is, in every respect, confirmatory of the views broached by him in relation to this subject; so also, indeed, is the one which he quotes from M. Lescure, in the fifth volume of the Memoirs of the Royal Academy of Surgery of Paris. In both these instances the intruding substance seems to have been fixed in exactly the same position, directly under the cricoid cartilage; and in both, the symptoms, after the first attack, were comparatively mild, being such, in general terms, as have been already enumerated. In Lescure's case, death occurred at the end of sixty hours from engorgement and emphysema of the lungs, caused by an apricot kernel, inhaled by a child four years of age. Mr. Hawkins's patient was twelve years old; he opened the trachea the day after the accident, and extracted, not without some little violence, from the manner in which it was fixed, a very rough and irregular piece of bone, nearly half an inch long and the third of an inch wide.

The other case adduced by Mr. Hawkins, occurred in the practice of Mr. Bullock, by whom it has been reported in the eighteenth volume of the *London Medical Gazette*. The foreign substance was a pebble, lodged partly within the trachea and partly within the larynx, where it was retained by a thick layer of plastic lymph. The child was seized immediately after the accident with a most violent convulsive cough, threatening suffocation, and continuing a full half hour, when it subsided. During the next few days she complained merely of a sense of soreness in the throat, and had copious expectoration, with nausea and occasional cough; there was no difficulty in swallowing. At the end of the fifth day, bronchial inflammation took place, and the cough now generally recurred in paroxysms six or seven times in the twenty-four hours. Finally, pneumonia came on, and caused death at the end of eight weeks. It is worthy of remark that, during the last four weeks of her illness, there was no return of convulsive cough, or suffering in the throat.

I regret that it is not in my power to add to the above cases any facts from my own practice, or from the observations of others, as recorded in this work. Although the foreign substance, in several of the instances herein analyzed, was permanently arrested in the trachea, yet, inasmuch as no definite statement is given of the symp-

toms in any of them, no use can be made of them in illustration of the present topic. I have presented a faithful outline of the facts adduced by Mr. Hawkins, in order that the reader may be able to draw his own conclusions. They are certainly entitled to attentive consideration; but whether they warrant the opinion which he has based upon them, is a question that can be determined only by future and more extended observation. All hasty generalization, especially when unsupported by the most irrefragable data, is not only unphilosophical, but dangerous, and therefore to be avoided.

CHAPTER VI.

SPONTANEOUS EXPULSION OF FOREIGN BODIES.

SECTION I.

GENERAL OBSERVATIONS.

The foreign substance is sometimes expelled spontaneously, or, in other words, by the patient's own unaided efforts. The circumstances under which this may take place are various. Thus it may happen, as indeed it most commonly does, during a violent paroxysm of coughing, while the individual is struggling, perhaps, for his very existence; or it may occur suddenly and unexpectedly, when there is an entire absence of suffering and spasm, by taking the parts, as it were, by surprise. In the former case, the extraneous body may be expelled at the commencement of the paroxysm, or the ejection may be delayed until the patient is almost exhausted, and the glottis completely relaxed in consequence. Posture, doubtless, exerts some influence upon the extrusion of the foreign body, but to what extent it would be difficult to determine. In a number of the cases narrated in this treatise, it occurred while the patient was lying with his head over the edge of the bed; in some, while he was sitting up; and in others, again, while he was in the erect posture.

It has been stated that the extraneous body, when the parts relieve themselves spontaneously, is most commonly ejected in a fit of coughing. By a reference to the accompanying table, it will be seen that this occurred thirty-seven times out of forty-nine cases; in eight, the mode of expulsion is not stated; in one it took place in sneezing; in one during spontaneous vomiting, and in one in dreaming. In this case, observed by Mr. Cock,[1] of London, the

[1] London Med. Gazette, vol. i. p. 554, 1845.

patient, a man aged thirty-five, the night after having inhaled a sixpence, fell asleep, and dreamed that he was drinking a pot of porter. The attempt to swallow made him cough, and when he woke he found the coin in his mouth. Such an occurrence can be explained only on the assumption that the extraneous substance took the parts by surprise, at a moment when the muscles of the larynx were in a state of complete repose, the slightest cough being then sufficient to dislodge and expel it.

The period during which the foreign body may remain in the air-tubes, after the first symptoms have passed off, varies from a few minutes to several hours, days, weeks, months, and even years. In one of the cases referred to under this head, the substance, a piece of bone, was retained sixty years. The circumstances which mainly influence this occurrence are, apparently, the size, form, weight, and situation of the extraneous body, the susceptibility of the parts concerned in its contact, the state of the patient's health, and the nature of the treatment.

It would be difficult, if not impossible, in the existing state of the science, to say whether small and light bodies are more easily disposed of in this manner than small and heavy, smooth than rough, round than angular, narrow than broad, short than long, blunt than sharp, soft than hard. The instances are numerous in which the air-passages have rid themselves of every variety of substance, even the most outré and ill-shaped, without the intervention of art in any way. The fact is interesting, inasmuch as it is calculated to encourage the practitioner to hope for relief in many cases in which he is prevented from using his knife, either on account of the advanced stage of the injury, the timidity of the patient, or the silly and improper interference of the patient's friends.

In a former chapter, we arranged foreign bodies into three great classes, the vegetable, animal, and mineral. Bearing in mind this division, we shall proceed to inquire, somewhat more minutely than has yet been done, into the ability, if it may be so denominated, of the respiratory organs to expel these different classes of substances after they have obtained admission into them. The first part of the inquiry will relate to spontaneous expulsion, followed by recovery; the second to spontaneous expulsion, followed by death.

SECTION II.

EXPULSION OF FOREIGN BODIES, FOLLOWED BY RECOVERY.

By a reference to the table, under the head of spontaneous expulsion, it will be seen that in the forty-nine cases therein mentioned, the foreign substances were of a vegetable character in twenty-four, animal in eleven, mineral in ten, and mixed in three. Twenty-nine of the patients were males, and sixteen females, the sex in four not being specified. Ten were under five years of age; eleven under ten; eleven under fifteen; three under twenty; and one under thirty. The remainder were, respectively, thirty, forty-two, fifty-eight, sixty-five, and seventy. A rapid analysis of these cases will not be without interest and instruction. In performing this part of our duty, we shall incidentally bring in such examples as have a direct bearing upon the subject, but the history of which is not sufficiently known to justify us in including them in the table referred to.

The table exhibits three cases of the spontaneous ejection of *cherry-stones*. In the first, related by Bonetus,[1] and treated by Senertus, the ejection took place at the end of three weeks, after having excited severe cough and pain in the side. In the second, observed by Dr. Webster,[2] of London, the intruder was expelled sixty-eight days after its introduction. The stone had been broken before it entered the tube, and its discharge was accompanied by more than a pint of thick, bloody pus. Pneumonia, abscess, and hectic fever had existed, but were kept in check by active treatment. The patient, a boy, aged fourteen, rapidly recovered, and twelve years afterwards, when again seen, was a strong, healthy man. The symptoms had indicated the left bronchial tube as the seat of the foreign body. In the third case, the patient, a woman, fifty-eight years old, experienced the ordinary symptoms, but after a while the suffering became less severe, and she never had either fever or expectoration. At the end of nine months she ejected a cherry-stone, of a yellowish color, and very thickly incrusted with calcareous matter.[3]

[1] Med. Sepentr. Collat. lib. ii. sect. ix.

[2] London Lancet, vol. i. p. 802, 1830.

[3] M. Malshieurat Lagemard, Amer. Journ. Med. Science, N. S. vol. iii. p. 476.

M. Guastamahia[1] mentions an instance in which a cherry-stone was expelled in a paroxysm of coughing, after having remained in the windpipe two months and a half.

The following remarkable case has been kindly communicated to me by my friend, Dr. Wulkupf, of this city.

Gerhard Gohmann, a German farmer, aged forty-six, while eating some cherries in July, 1836, accidentally inhaled one of the kernels. Violent coughing instantly ensued, attended with a sensation of impending suffocation. The man applied to Dr. Dubbelhof, of Nienkirchen, in Hanover, but obtained no relief. For three years he suffered constantly from a feeling of a heavy weight in the chest, especially in walking, which, however, gradually disappeared, leaving him with merely a troublesome cough, and a slight expectoration, sometimes tinged with blood. He remained in this state until May, 1847, when, in a violent paroxysm of coughing, he ejected a globular body, rather larger than a full-grown cherry, and consisting of a firm, dense substance, the nucleus of which was formed by the foreign body in an unaltered condition. His health rapidly improved after this occurrence, and, though his cough has never entirely left him, he is now a stout, hale-looking man.[2]

Under this head may be mentioned the case refered to in the table, and related by Mr. H. G. Harbord,[3] of a girl, ten years old, who, on the fourth day after the accident, coughed up a *damson-stone*. She had the ordinary symptoms, with mild bronchitis, and had used an emetic of sulphate of zinc, and anodynes.

Nuts, pieces of nuts, and nut-shells, are among the substances that have been spontaneously ejected from the air-tubes. The table makes mention of not less than six examples of this kind.

The first case, observed by Dr. J. Reiche,[4] was that of a girl, aged two years and a half, who, after having labored under violent cough and excessive dyspnœa, followed by convulsions, and emphysema of the neck, coughed up a piece of nut three days after the accident. Emetics and expectorants had been exhibited. A child, less than one year old, whose case is mentioned by Dr. Charles Smith, in the twenty-second volume of the *Boston Medical and Surgical*

[1] Gazette Médicale, 1838, p. 797; Velpeau's Operative Surgery, by Townsend and Mott, vol. iii. p. 467.

[2] London Lancet, vol. i. p. 801, 1839–40.

[3] London Med. Gazette, vol. xxiii. p. 672.

[4] Rust's Magazine für die Gesammte Heilkunde, B. 27, 1828.

Journal, suffered constant difficulty of breathing for upwards of five months, when she threw up a piece of butter-nut shell. Dr. Craigie,[1] of Edinburgh, records an instance of a child, aged four years, who, at the end of the fifty-second day, coughed up a piece of the kernel of a walnut. The principal symptoms were loss of strength and flesh, croupy cough, and absence of respiration in the right lung. Dr. A. H. Thompson[2] observed an instance in a child, one year of age, who coughed up half a pea-nut eight months after the accident. There were no urgent symptoms after the first few hours. The child had taken emetics and other remedies. In the *Provincial Medical and Surgical Journal*, a British periodical, for September, 1843, is an account of a girl, five years and a half old, who, after having labored for nine years and a half under troublesome and obstinate cough, attended with expectoration of matter, and an arrest of physical development, ejected, at the expiration of this time, in a fit of coughing, a beech-mast. A young man, nineteen years old, after having endured great pectoral distress, accompanied with hectic fever and bloody sputa, ejected, at the end of three months, a piece of hazel-nut.

The following cases, not mentioned in the table, are interesting, though their history is imperfect.

A woman, having swallowed a filbert while in the act of laughing, was seized with a violent cough, which continued to torment her for two months, and was followed by emaciation and hectic fever. The symptoms, in short, were such as to induce her physician to conclude that she had pulmonary phthisis. Jean Dominique de Sala being sent for, found, upon inquiry, that she had inhaled a foreign body, to which, therefore, he was inclined to ascribe all her suffering, the more especially as the respiration was embarrassed, and the expectoration neither bloody nor purulent. He administered, without benefit, an emetic of honey of roses and common oil, followed by an emulsion of sweet almonds. At length, she ejected the nut by expectoration, and from that moment she began to recover.[3]

A man, whose case is mentioned by Tulpius,[4] was troubled for more than seven years with obstinate cough, and difficulty of breathing, which had reduced him almost to the brink of the grave.

[1] Edinb. Med. and Surgical Journ. vol. xlii. p. 106. 1834.

[2] Boston Med. and Surgical Journ. for 1853.

[3] Louis's Second Memoir on Bronchotomy, in *op. cit.* p. 266.

[4] Lib. ii. obs. vii.

At length, he coughed up a bit of the shell of a filbert, which had been lodged, as Tulpius supposed, near the mouth of the windpipe. Borelli[1] gives the history of a gentleman, who, after having labored for some time under symptoms of phthisis, recovered his health upon ejecting a piece of nutmeg which had slipped into the larynx.

In three of the cases, analyzed in the table, the extraneous bodies were *grains of corn*. One of these cases was communicated to me by Dr. W. Stapp, of Kentucky. The patient was a girl, six years of age, who suffered in the usual manner until the fifth day, when a fit of coughing relieved her of her difficulty. In another case, reported to me by Dr. J. D. Maxwell, of Bloomington, Indiana, the intruder was expelled on the ninth day in a paroxysm of coughing, after having resisted the exhibition of emetics. The patient was a boy, aged five years, and the substance had been perceived moving up and down the trachea. In the third case, for which I am also indebted to Dr. Maxwell, a girl, six years old, threw up a fragment of a grain of corn at the end of five weeks. She had labored under distressing cough and copious expectoration, with emaciation, for the relief of which she had used emetics and other remedies.

Water-melon seeds are noticed in five of the cases. In the first, reported to me by Dr. J. D. Maxwell, the expulsion happened on the forticth day. The patient was a girl six years old; the substance had been detected moving up and down the trachea, and trial had been made of emetics. In the second case, observed by Dr. R. J. Hodge, the substance induced asthmatic symptoms, and was ejected in a fit of coughing, four months after its introduction. In the third case, that of Dr. M. S. Perry, the seed was also expelled at the end of four months; the symptoms were strongly laryngeal, and the patient was unable to lie down in bed during the whole period of his illness. In the fourth, communicated to me by Dr. J. D. Maxwell, the expulsion took place in the act of vomiting, consequent upon an attack of intermittent fever, five months after the accident; the patient, a girl, aged fourteen years, had all the symptoms of phthisis. The fifth case was observed by one of my former pupils, Dr. Greenbury R. Henry,[2] of Burlington, Iowa. It occurred in a girl, three years of age, who, after having

[1] Hist. Med. Phys. Cent. Quest. Paris, 1656.

[2] Iowa Medical Journal, vol. i. p. 203. 1854.

labored under obscure secondary symptoms, and an attack of pneumonia, coughed up the seed at the end of fifteen months.

Although there are but five cases mentioned in the table of water-melon seeds having been spontaneously ejected, it would not be just thence to infer that accidents from this cause are uncommon. On the contrary, the reverse is undoubtedly true. By a reference to the different tables in this treatise, it will be seen that these substances are frequently alluded to, and many examples of a similar nature are incidentally mentioned in our periodical literature. Thus, Dr. J. W. Heustis,[1] of Alabama, declares that he has known cases in which water-melon seed, after having remained in the windpipe several weeks, and even months, and induced all the symptoms of pulmonary phthisis, were at length expelled along with the expectorated matter, followed by perfect recovery. Dr. Jameson,[2] of Baltimore, saw an instance in which a little child threw up a water-melon seed, about five weeks after it had been inhaled, and afterwards regained its health. A still more remarkable case was observed by Dr. Mackenzie, also of Baltimore. In this case, the seed was expelled at the end of about five years, after having caused much pulmonary distress and danger from suffocation.[3] Dr. John L. Atlee, of Lancaster, Pennsylvania, informs me that he met with a case of this kind in a very young child, in which the seed was coughed up a number of weeks after it had been sucked into the windpipe.

As allied to this class of substances, allusion may here be made to a case, observed by Dr. Charles Smith,[4] of Ohio, in which a child, after having been nearly suffocated every night for six weeks, ejected the skin of a *pumpkin* seed.

It is remarkable that the table does not contain a solitary example of the spontaneous ejection of a *bean*. Nevertheless, a few cases of this description have occasionally occurred, but their histories have been inaccessible to me. Thus, one is mentioned by Dr. Oesterlen, in the sixth volume of Graefe and Walther's *Journal der Chirurgie und Augenheilkunde*, in which a girl, aged seven years, ejected from her windpipe a bean inhaled nineteen days previously. In the same work, two similar examples are referred to by Dr.

[1] New York Med. and Physical Journ. vol. v. p. 559. 1826.
[2] American Med. Recorder, vol. v. p. 677. 1822.
[3] American Med. Recorder, vol. vi. p. 158. 1823.
[4] Boston Med. and Surg. Journ. vol. xxii. p. 318. 1840.

Klein. In a case observed by Dr. L. Pagen,[1] a young child threw up, by its own efforts, at the end of forty days, a bean. The body, which came up in fragments, was supposed to have been arrested in the larynx, and, what is singular, the symptoms induced by its presence were always calmed, as if by enchantment, by the exhibition of a teaspoonful of olive oil. Boussier de la Bouchardiere[2] gives an instance in which a bean was ejected five days after the accident, the patient making a happy recovery.

An instance is mentioned in the table, in which a *grain of coffee* was coughed up three months after it had entered the windpipe. It occurred under the observation of Dr. J. W. Clark, a graduate of the University of Louisville, in a child twelve months old, who had suffered from pneumonia, and had been obliged to use emetics and other remedies for its relief.

Various *vegetable substances* have been spontaneously ejected from the air-passages. Numerous cases of this kind are upon record, and a few may be adduced from the table and other sources in illustration of the subject.

The late Dr. Barrow, of London, for some time attended a gentleman, on account of severe pectoral symptoms, so much like phthisis that he was not expected to survive. Early one morning, however, he coughed up a piece of *ginger*, thickly incrusted with a hard mucus-looking matter, followed by prompt recovery. It appears that the patient, on retiring at night, had often taken a piece of that substance into his mouth for a complaint of the stomach, and that he had done so at the very commencement of his pulmonary affection, but missed it in the morning. No doubt it had slipped into the windpipe during sleep, and occasioned all the subsequent symptoms.[3]

I have heard of a number of instances in which *cockle-burs* have been coughed up. The one in the table, reported to me by Dr. Pyles, of this city, is full of interest. It occurred in one of his own relatives, a young gentleman, thirteen years old, and after having caused violent cough and frequent suffocative paroxysms, was ejected on the thirteenth day. Dr. W. Donalson[4] has published the case, alluded to in the table, of a girl, aged eleven years, who, on

[1] Capuron, in Archives Gén. de Médecine, 3d series, t. vii. p. 369. 1840.

[2] Journal de Médecine, t. xlv. p. 267.

[3] Dr. Webster, London Lancet, vol. i. p. 482, 1849.

[4] Edinb. Med. and Surg. Journ. vol. xlii. p. 102, 1834.

the fiftieth day after the accident, ejected an ear of *grass*, the presence of which had given rise to violent cough, and pulmonary distress, followed, after some time, by the most fetid expectoration and pain in the chest. A similar instance is recorded in the *Northern Journal of Medicine*, a Scotch periodical, for August, 1845. A boy, aged five years and a half, while chewing, in 1840, a piece of crested *dog-tail grass*, got the entire ear into the windpipe. Inflammation and expectoration of pus and blood came on, and finally threatened hectic fever, when, in a violent fit of coughing, twenty-two months afterwards, the foreign body was expelled, and the child soon regained his health.

Dr. Watson,[1] of London, alludes to an instance in a lady who spontaneously ejected an ear of *barley* seven years after the accident. During all this time she had repeated attacks of hemoptysis.

In one of my own cases, given at length elsewhere, a girl, aged seven years, brought up a piece of *cedar* at the end of five weeks, and subsequently a piece of silk thread. The most prominent symptoms were harassing cough and constant tickling in the fauces, for the relief of which expectorants had been freely used.

Dr. Nathan Allen,[2] of New England, attended a youth of fourteen, who, after having in vain tried emetics and other remedies, ejected, at the end of ten days, a piece of *charcoal*.

In the case of Dr. Houston,[3] of Dublin, alluded to in the table, a boy, eleven years old, coughed up a piece of wood on the thirty-fifth day after the accident. Dr. Gridley[4] met with an instance, also mentioned in the table, of a boy nine years of age, who at the end of six years ejected a *lead-pencil*.

In eight of the cases referred to in the table, the foreign substances were *pieces of bone*. In the first of these cases, narrated by Dr. T. Arnot,[5] the ejection occurred on the thirty-seventh day, in a fit of coughing. The patient was a man thirty years of age; the prominent symptoms being pleuritic pains, great dyspnœa, fetid breath, and general wasting. The treatment consisted of venesection, emetics, and expectorants. Dr. Thomas Stabb[6] has

[1] Principles and Practice of Medicine, p. 667, Condie's edit., Philad. 1845.

[2] Boston Med. and Surg. Journ. vol. xxxviii. p. 195, 1848.

[3] Dublin Hospital Reports, vol. v. p. 598, 1830.

[4] American Med. Recorder, vol. xiii. p. 473.

[5] Edinburgh Med. Essays, vol. v. part 2, p. 613.

[6] London Medical Gazette, Dec. 1830.

published the particulars of the case of an infant, aged ten months, who ejected a piece of bone on the forty-eighth day, the principal symptoms having been a severe cough and a saw-like sound in breathing. In Dr. Dunlap's case, the patient, an old man of seventy, relief was attained at the end of eight weeks, after an attack of pneumonia, followed by general debility. In the case reported by Louis,[1] the woman suffered for four months, the most prominent symptoms being constant cough and fever, with bloody expectoration, emaciation, and loss of strength. A similar instance is mentioned by Dr. Dicke,[2] of Wesel, Germany. A girl of seventeen, after having in vain used emetics and other remedies, and suffered from hectic fever, expelled a piece of bone at the end of four months. In Dr. Herrick's[3] case, the symptoms were those of phthisis. The patient was a female, aged twenty-five, and the intruder was ejected at the end of two years. In the instance recorded by Dr. James Duncan,[4] upwards of four years had elapsed before expulsion took place, the patient being forty-two years old. The symptoms were variable; at one time severe, at another comparatively mild. But the most remarkable case of all is that reported by Dr. R. Bartlett,[5] of a man, who at the age of three inhaled a piece of bone which was not ejected until after a sojourn in the air-passages of sixty years. The principal symptoms were protracted cough and dyspnœa, fixed pain in the right side of the chest, purulent expectoration and hemoptysis; the general health remaining moderately good. It is worthy of remark that in all these cases the foreign substances were expelled by coughing.

Dr. C. F. Hufeland[6] has recorded the following case. A girl eighteen years old, inhaled one of the bones of the head of a fish, called a pike, three-quarters of an inch in length by half an inch in width. At the end of the seventh week thereafter, she was suddenly seized with a violent paroxysm of coughing, with suffocative symptoms, and sharp, cutting pains in the windpipe, followed by the ejection of the foreign substance and the complete recovery of her

[1] Second Memoir on Bronchotomy.

[2] Rust and Casper's Repertorium der Gesammte Heilkunde, B. xvii. p. 427, Berlin, 1827.

[3] Am. Journ. Med. Sciences, N. S., vol. xiii. p. 517.

[4] Northern Journ. of Medicine, August, 1845.

[5] Lee's New York Journ. Med. and the Collateral Sciences, vol. vi. p. 23.

[6] Rust and Casper's Repertorium der Gesammte Heilkunde, B. xvii. p. 427, Berlin, 1827.

health. In the transactions of a foreign medical society,[1] is recorded the case of a soldier, who after having labored under cough, dyspnœa, muco-purulent expectoration, and other evidences of pulmonic disease for five months, recovered upon ejecting from his windpipe a piece of bone of the size of a small nut. In another instance, recorded in the same periodical, a female expelled a fragment of bone eighteen months after the accident, and perfectly regained her health. The symptoms were, at first, dry cough, and pain in the left side of the chest, and, afterwards, copious purulent and bloody expectoration with hectic fever. Under the head of medical treatment, a case is mentioned from Mr. Day,[2] of England, in which, under the influence of iodine inhalations, an old lady ejected the vertebra of a fish which she had inhaled upwards of four years previously. It was five-sixteenths of an inch in length, and of proportionate width.

Dr. Webster,[3] of London, at a meeting of the Royal Medical and Chirurgical Society of that city, on the 11th of February, 1840, referred to a very interesting and curious case of a foreign body in the windpipe, that occurred early in the last century. The patient was an old Scottish covenanter, of the name of John Stevenson, who, in swallowing a piece of bone of the size of a hazel-nut, let it descend into the trachea. Much pulmonary disturbance, having, as the man said, "the character of a decline," followed, and continued for fourteen years and nine months. At the end of this time, the intruder was ejected in a paroxysm of coughing, and in a short time the man was perfectly well. A similar example is mentioned by Mr. Holman,[4] an English writer. Here, the piece of bone, which was three-quarters of an inch in length, was ejected at the end of fifteen years, a few months later than in the former case. The chief symptoms were harassing cough, purulent expectoration, occasionally streaked with blood, and hectic fever. The recovery was complete. Mons. Claubry[5] has published the particulars of a case in which the piece of bone was coughed up at the end of fourteen years. The patient had symptoms of consumption, and, during the last four years, frequent attacks of hemoptysis.

[1] Frid. Lud. Bang. Acta Regiæ Med. Societ. vol. i. p. 96, Hav. 1783.
[2] London Med. Gazette, vol. ii. p. 765, 1833.
[3] London Lancet, vol. i. p. 802. 1839–40.
[4] London Medical and Surg. Journ. vol. vii. p. 126.
[5] Sedillot, Journal Gén. de Méd. t. xxxiv. p. 13. 1809.

As an appendix to the above examples, may be mentioned the two following, both alluded to in the table. A girl, aged twelve years, whose case is described by the younger Mr. Travers,[1] having inhaled a piece of *cowdrie shell*, ejected it one night, in a fit of coughing, after it had been in the windpipe twelve months. The symptoms, which were at first of an ordinary character, were finally followed by hemoptysis. An instance in which the claw of a *craw-fish* was retained for seven years, and then expelled, is mentioned by Professor Walther;[2] the patient was seventeen years old at the time of the accident, and the symptoms resembled those of pulmonary phthisis.

Finally, we may mention, in this connection, the case of Mr. R. S. Nunn,[3] in which a *puff-dart*, as it is called, was coughed up two months after it had obtained admission into the windpipe. The symptoms, which continued bad for some time after this happy riddance, were absence of respiratory sound in the left side, abscess of the lung, and copious expectoration of pus. An instance, in which a *button-foil* was coughed up at the end of six months, after having given rise to copious expectoration and profuse night-sweats, is related by Dr. J. C. Lettsom.[4] The patient was a lad, twelve years old.

Dr. J. W. Heustis,[5] of Cahawba, Alabama, knew a little girl, who, after having been excessively harassed for several months with most distressing cough, dyspnœa, and wheezing noise in the chest, at length ejected from her windpipe a piece of *feather*, nearly two inches in length. It had remained so long in the parts, that, as the reporter remarks, most of the plumage was worn off and decayed, leaving little else than the stem. A somewhat similar instance occurred to Professor Colles,[6] of Dublin, in a child who had drawn a *popgun*, made of a piece of quill, charged with a bit of raw potato, into his windpipe. The mother would not consent to an operation, and the foreign substance was subsequently ejected in a fit of laughter.

[1] Medico-Chirurgical Transactions of London, vol. xxiii. p. 116.

[2] Graefe and Walther's Journ. der Chirurgie, as quoted by Amer. Med. Recorder, vol. vi. p. 571.

[3] Provincial Med. and Surgical Journ. July, 1849.

[4] Pettigrew's Memoirs of Lettsom's Life and Writings, vol. iii. p. 82. London, 1817.

[5] New York Med. and Physical Journ. vol. v. p. 562. 1826.

[6] Lectures on Surgery, by McCoy, p. 104, Philadelphia edition, 1845.

The table refers to two cases in which *teeth* were coughed up. Of these, one occurred in the practice of Dr. Thomas Wallace,[1] of Derry, New Hampshire, and the other, in that of Dr. J. B. Borsieri, of Europe.[2] In the former, three artificial teeth in one block, with two wooden pivots, accidentally passed into the windpipe on the 10th of February, 1837, and after having remained there forty-six days, they were coughed up along with about half a teacupful of pus. The expectoration, which had been copious and fetid, continued for some time after the expulsion of the foreign body. In the case of Borsieri, a girl from ten to twelve years of age, ejected a molar tooth at the end of the sixth or seventh week after its entrance into the trachea. She had labored under violent and harassing cough, pleuritic pains, and fever, along with dyspnœa, which was always worse at night, and increased by the horizontal posture. This is probably the same case as that referred to by Mons. Velpeau,[3] as being mentioned by Monteggia.

Dr. William Pepper, of Philadelphia, informs me that he recently met with a case in which a young child inhaled a deciduous tooth, which became fixed in the right bronchial tube, producing chronic pneumonia. After some time, the tooth was coughed up, and the patient completely recovered.

Nails were the substances mentioned in four of the cases in the table. In one, observed by Dr. J. M. Warren,[4] of Boston, a boy, between two and three years old, inhaled a horseshoe nail, which was expelled about the end of the fourth week, after having kept up a violent cough, followed by frequent choking fits, night-sweats, and emaciation. Mr. John Howship,[5] of London, has related an instance in which nearly four months elapsed before riddance was effected. The patient, a man, aged sixty-five, had cough, constant spitting of blood, fixed pain in the right lung, and great emaciation. Dr. Craigie,[6] of Edinburgh, saw an instance in which a child, aged five years, threw up, thirteen months after the accident, a screw-nail. The patient had suffered from pneumonia, pleurisy, and bronchitis,

[1] Boston Med. and Surg. Journ. vol. xvi. p. 206, 1837. The reporter does not specify whether the teeth were human or mineral.

[2] Institut. Med. Pract. 3, cap. 17, Leipsic, 1786.

[3] Operative Surgery, by Townsend, vol. iii. p. 497.

[4] Boston Med. and Surgical Journ. vol. xxxvii. p. 392. 1847.

[5] Practical Observations in Surgery, p. 222. London, 1816.

[6] Elements of General and Pathological Anatomy, p. 590. Edinb. 1848.

and there was a sensible change in the conformation of the chest. In the interesting and instructive case communicated to me by my friend and colleague, Professor Austin Flint, nearly three years intervened between the occurrence of the accident and the expulsion of a trunk nail. The child, who was eight years old, had labored under pectoral distress, soreness of the chest, hectic fever, and great wasting. The ejection in every one of these cases occurred in a fit of coughing.

Dr. Watson,[1] of London, was called to a boy who had got a *tack* into the windpipe. He found him apparently well, but was told that he had been subject, ever since the accident, to paroxysms of the most violent cough and suffocative feelings, menacing his life. It was evident, both from the history and symptoms of the case, that the tack was still in the air-passages, and the question, it seems, was much mooted, what should be done? In this state of uncertainty, the consequence was that nothing was done; the case was left to chance, and after the lapse of several weeks the substance was fortunately coughed up.

The following case happened in Boston, and is recorded in the sixth volume of the *New England Journal of Medicine and Surgery*. A boy, aged thirteen years, inhaled a white tack, or *pump-nail*, in February, 1814. Soon after, he was found to be laboring under a slight cough and occasional difficulty of breathing, which were supposed to have resulted from exposure to cold, and excited so little alarm that his parents did not deem it necessary to consult a physician until March, 1817, that is, upwards of three years after the accident. Dr. Brown was then sent for, and discovering symptoms of pneumonia, bled and blistered the boy, with the effect of affording him speedy relief. In the latter part of the following month he had a fit of coughing, in which he threw up the tack, which was discolored and partly oxidized. Perfect recovery was the consequence.

Dr. J. Mason Warren[2] had a case in which a *carpet-nail* slipped into the windpipe; it produced the usual train of phenomena, and, after various attempts to dislodge it, was at length expelled in a paroxysm of coughing.

Several instances of the spontaneous escape of *bullets* and *shot*

[1] Lectures on the Principles and Practice of Medicine, p. 666, Dr. Condie's ed., Phila. 1845.

[2] Letter to the author, March 29, 1854.

have occurred. I may mention the following as illustrative of the subject.

In the case of a boy, aged five years, communicated to me by Dr. J. D. Maxwell, of Indiana, a bullet, entrapped eight weeks previously, was ejected in a violent fit of coughing while the little patient's head was in a dependent position. A similar case has been mentioned to me by Dr. A. G. Stitt, a graduate of the University of Louisville. A negro boy, ten years old, of Nicholas County, Kentucky, inhaled a leaden bullet from three to four lines in diameter, which remained in one of the bronchial tubes seven weeks and one day, producing violent cough with expectoration, severe pain in the side, and rapid emaciation. At the end of this period, it was ejected in a violent fit of coughing, followed by speedy and complete recovery.

A man, whose case occurred in the practice of the late Mr. Rose, of London, having been wounded in the throat, suffered for many years under pectoral symptoms, which promptly disappeared after he coughed up half a musket-ball.[1]

The cases of Newman and Liston, in which bullets, lodged in the windpipe, were expelled by suddenly inverting the body, without the aid of tracheotomy, are alluded to in another part of this work.

The case of Dr. Nooth[2] is well known. This gentleman, during his residence at Quebec, inhaled, while drinking a glass of wine, a large *shot*, which he ejected in a violent and protracted fit of coughing, two years afterwards. It is worthy of remark that he was lying at the time with his head and face downwards. He rapidly regained his health and strength after this happy riddance. A similar instance, which will be found at length under the head of "Inversion," occurred in Maryland, early in the present century, and is reported by Dr. Richard Hopkins, in the first volume of the *Baltimore Medical and Philosophical Lyceum*. A young lady having inhaled a shot, her mother, without apprising her of her intention, suddenly seized her while lying over the edge of the bed, and forced her head towards the floor. The foreign body, being carried by this movement towards the glottis, was instantly discharged.

Pieces of *coin* have occasionally been spontaneously ejected from

[1] Dr. Webster, London Lancet, vol. i. p. 805. 1839–40.

[2] Transactions of the Medico-Chir. Society of London, vol. iii. p. 1. 1812.

the windpipe. The examples, however, are rare. Only one is mentioned in the table. In this instance, already referred to, the patient, a man thirty-five years old, inhaled a sixpence, which he threw up the night after in a dream without being at the moment aware of the fact.[1] A similar case is mentioned by Mr. Hewett in the *London Lancet* for April, 1849. An omnibus conductor having swallowed a fourpenny bit, was taken to St. Thomas's Hospital, where they inverted his body, and repeatedly struck his back and chest, with no other effect than that of exciting severe coughing. He afterwards entered St. George's Hospital, where Mr. Hewett found him with pulmonary irritation, bronchitis, and a husky voice, but without any disorder of the general health. Tracheotomy was determined upon, but the day previous to that selected for the operation the man threw up the coin, and soon recovered.

The following case is related by Hechstetter.[2] A citizen of Augsburg, under the idea of curing his toothache, put a *Portugal ducat* into his mouth. On waking he found the piece gone. As he experienced no particular inconvenience, he concluded that it had passed into the stomach, and gave himself no further concern. Sometime afterwards, however, he became hoarse and thin, and therefore consulted several physicians and surgeons, who were unable to reach the foreign substance either with the finger or forceps. Finally, at the end of two years and two months, it was spontaneously ejected, followed by the restoration of the patient.

Under this head may be mentioned the case of Dr. C. Bannister,[3] of a child, aged two years and a half, who, in a fit of sneezing, threw up a piece of *brass* six weeks after the accident. From the nature of the symptoms, total aphonia, croupy cough, and asthmatic respiration, the probability is that the substance was lodged in one of the ventricles of the larynx. To the same category belongs the interesting case, communicated to me by Professor Hamilton, of Buffalo, of a boy of fourteen years, who, at the end of one hundred and four days, ejected a *tin whistle*. Allusion is made to these cases in the table.

As a kind of *appendix* to the cases of spontaneous expulsion, analyzed in the foregoing pages, we may mention the following, in

[1] Mr. Cock, London Medical Gazette, vol. i. p. 554, 1845.

[2] Obs. Decad. vi. cap. x.

[3] Boston Med. and Surgical Journ. vol. xxxvi. p. 142, 1847.

which, although bronchotomy was performed, the offending body was not ejected until after the closure of the wound. The cases may, therefore, in every respect, be considered as examples of spontaneous expulsion.

The list embraces nine cases, of which one occurred in my own practice. The foreign substances were, respectively, a grain of corn, piece of hazel-nut shell, nail, pebble, cherry-stone, fiddle-peg, watermelon seed, the skin and kernel of a nut, and the wooden stopper of an inkstand. Five of the patients were females and four males. Their ages varied from three years to nineteen; all, excepting two, being under ten. The operation in eight was tracheotomy, and in one laryngotomy. The period of the expulsion, after the operation, was, in one instance, "several weeks;" in two, twenty-eight days; in one, thirty-three days; in one, forty-seven days; in one, "some months;" in one, two months and a half; and in two, three months.

TABLE OF CASES OF SPONTANEOUS

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.
1	Piece of nut	Female	2½ years	Violent coughing; emphysema of the neck; immense difficulty of breathing; convulsions.
2	Sixpence	Male		Copious discharge of blood from air-passages; violent cough; movement of coin up and down trachea; soreness of windpipe.
3	Damson-stone	Female	10 years	Ordinary, with mild bronchitis.
4	Grain of corn	Female	6 years	Ordinary.
5	Grain of corn	Male	5 years	Body moving up and down windpipe.
6	Piece of charcoal	Male	14 years	Cough and dyspnœa, followed by inflammation; obstruction of the right bronchial tube.
7	Cockle-bur	Male	13 years	Violent cough, and frequent suffocative paroxysms.
8	Cherry-stone	Male		Severe cough, and pain in the side.
9	Horseshoe nail	Male	Upwards of 2 yrs.	Choking and violent cough, followed by night-sweats and emaciation.
10	Part of a grain of corn	Female	6 years	Distressing cough; emaciation, and copious expectoration.
11	Piece of wood	Male	11 years	Substance moving up and down the windpipe.
12	Piece of bone	Male	30 years	Pleuritic pains; loss of flesh and strength; fetid breath; great dyspnœa.
13	Piece of cedar and piece of silk thread	Female	7 years	Distressing and almost incessant cough, with constant tickling in the throat.
14	Watermelon-seed	Female	6 years	Body moving up and down windpipe.
15	Piece of brass		2½ years	Total aphonia; emaciation; absence for a time of ordinary symptoms; croupy and asthmatic symptoms after ejection of substance.
16	Three artificial teeth, with their block and two pivots	Male		Copious and fetid expectoration, continuing for some time after ejection of foreign body.
17	Piece of bone	Male	10 months	Cough, and saw-like sound in breathing.
18	Molar tooth	Female	10 to 12 years	Violent and harassing cough; dyspnœa always worse at night, and increased by horizontal posture; pleuritic pains and fever.
19	Ear of grass	Female	11 years	Violent cough and great pectoral distress, followed by fetid purulent expectoration and pain in the chest.
20	Piece of the kernel of a walnut	Male	4 years	Loss of strength and flesh; croupy cough; absence of respiration in right lung.
21	Piece of bone	Male	70 years	Pneumonia; prostration; swelling of feet and legs.
22	Leaden bullet	Male	5 years	No respiratory murmur in right lung.
23	Puff-dart	Male		Absence of respiratory sound in left side; abscess, and copious discharge of pus; continuance of bad symptoms after expulsion of foreign body.
24	Piece of butternut-shell		Less than 1 year	Constant difficulty of breathing.
25	Piece of cherry-stone	Male	14 years	Pneumonia; abscess; hectic fever.
26	Grain of coffee		12 months	Pneumonia; substance playing up and down trachea.
27	Piece of hazel-nut	Male	19 years	Ordinary, followed by hectic fever, and frequent expectoration of blood.
28	Tin whistle	Male	14 years	Very slight throughout.

EXPULSION, FOLLOWED BY RECOVERY.

TREATMENT.	PERIOD AND MODE OF EXPULSION.	REPORTER.	AUTHORITY.
Emetics and expectorants	Three days after accident; in coughing.	Dr. J. Reiche	Rust's Mag. für die Gesammte Heilkunde, B. xxvii., 1828.
	A few days; in dreaming.	Mr. Cock	London Med. Gazette, i. 516, New Series.
Emetics and anodynes	Fourth day; in coughing.	Mr. H. G. Harbord	Lond. Med. Gaz., xxiii. 672.
	Fifth day; in coughing.	Dr. W. Stapp	Author.
Emetics	Ninth day; in coughing.	Dr. J. D. Maxwell	Author.
Emetics	Tenth day; in coughing.	Dr. Nathan Allen	Boston Med. and Surg. Journ., xxxviii. 195, 1848.
	Thirteenth day; in coughing.	Dr. M. Pyles	Author.
	Three weeks; in coughing.	Bonetus	Medic. Septentr. Collat., lib. ii. sec. ix.
	Four weeks.	Dr. J. M. Warren	Boston Med. and Surg. Journ., xxxvii. 392, 1847.
Emetics and expectorants	Five weeks.	Dr. J. D. Maxwell	Author.
	Thirty-fifth day; in coughing.	Dr. Houston	Dublin Hospital Reports, v. 598, 1830.
Bleeding, emetics, and expectorants	Thirty-seventh day; in coughing.	Dr. T. Arnot	Edinb. Med. Essays, v. part 2, 613.
Expectorants	Upwards of five weeks.	Author	Author.
Emetics	Fortieth day.	Dr. J. D. Maxwell	Author.
	Six weeks; in sneezing.	Dr. C. Bannister	Boston Med. and Surg. Journ., xxxvi. 142, 1847.
	Forty-six days; in coughing.	Dr. Thomas Wallace	Boston Med. and Surg. Journ., xvi. 206, 1837.
Antimonials	Forty-eighth day; in coughing.	Mr. Thomas Stabb	Lond. Med. Gaz., Dec. 1830.
	Sixth or seventh week; in coughing.	J. B. Borsieri	Institut. Med. Pract. iii. cap. 17, Leipsiæ, 1786.
	Fiftieth day; in coughing.	Dr. W. Donaldson	Edinb. Med. and Surg. Journ., lxii. 102, 1834.
	Fifty-second day; in coughing.	Dr. Craigie	Edinb. Med. and Surg. Journ., lxii. 106, 1834.
	Eight weeks; in coughing.	Dr. R. M. Dunlap	Author.
Emetics	Eight weeks; in coughing.	Dr. J. D. Maxwell	Author.
Bleeding; leeching; blisters to chest; expectorants	Two months; in coughing.	Mr. R. S. Nunn	Provincial Med. and Surg. Journ., July, 1849.
	Upwards of two months.	Dr. Charles Smith	Boston Med. and Surg. Journ., xxii. 318, 1840.
	Sixty-eight days; in coughing.	Dr. John Webster	London Med. and Physical Journ., lvi. 430, 1826.
Emetics and antiphlogistics	End of three months; in coughing.	Dr. J. W. Clark	Author.
	End of three months; in coughing.	Author	Author.
	One hundred and four days.	Dr. F. Hamilton	Author.

TABLE OF CASES OF SPONTANEOUS

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.
29	Nail	Male	65 years	Cough; constant spitting of blood; fixed pain in right lung, and great emaciation.
30	Piece of bone	Female		Constant cough and fever; bloody expectoration; symptoms of phthisis.
31	Watermelon-seed	Male	5 years	Laryngeal symptoms, simulating croup; shrill voice; dyspnœa; inability to lie down; marasmus.
32	Piece of bone	Female	17 years	Severe croupy cough; dyspnœa and lividity of face, followed by pain in right side, fever, and bloody expectoration.
33	Watermelon-seed	Male		Asthmatic symptoms.
34	Watermelon-seed	Female	14 years	Harassing cough, copious expectoration, and emaciation.
35	Button foil	Male	10 years	Copious expectoration, and profuse night-sweats.
36	Half a peanut		1 year	No urgent symptoms after first few hours.
37	Cherry-stone	Female	58 years	Violent cough, and suffocative feeling.
38	Cowdaie-shell	Female	12 years	Ordinary; but finally followed by hæmoptysis.
39	Screw-nail	Male	5 years	Pneumonia, pleurisy, and bronchitis; change in form of chest; probable lodgement of the substance in right bronchia.
40	Watermelon-seed	Female	3 years	Secondary symptoms obscure; pneumonia.
41	Head of grass	Male	5½ years	Dyspnœa; harassing cough and purulent expectoration, with impending hectic.
42	Shot	Male		Asthmatic symptoms.
43	Fish-bone	Male	25 years	Symptoms of phthisis.
44	Trunk-nail	Female	8 years	Pectoral distress; great emaciation; hectic fever; and soreness in chest.
45	Piece of bone	Male	42 years	Variable; at one time severe, and at another comparatively mild.
46	Lead-pencil	Male	9 years	Ordinary.
47	Claw of a craw-fish	Male	17 years	Symptoms of pulmonary phthisis.
48	Beech-mast	Female	5½ years	Troublesome and obstinate cough; discharge of pus, but no symptoms of phthisis; arrest of physical development.
49	Piece of bone	Male	3 years	Protracted cough and dyspnœa; fixed pain in right side of chest; purulent expectoration; hæmoptysis; general health moderate.

EXPULSION, FOLLOWED BY RECOVERY.

TREATMENT.	PERIOD AND MODE OF EXPULSION.	REPORTER.	AUTHORITY.
	Nearly four months; in coughing.	Mr. John Howship	Practical Observations in Surgery, &c., p. 222, London, 1816.
	Four months; in coughing.	M. Louis	Louis's Second Memoir on Bronchotomy.
	Four months; in coughing.	Dr. M. S. Perry	Dr. J. B. S. Jackson's Descriptive Catalogue of Anat. Museum of Boston Society for Medical Improvement, p. 119, 1847.
Emetics and other means	Four months; in coughing.	Dr. Dicke	Rust and Casper's Repertorium der Gesammte Heilkunde, xvii. 427, 1827.
	Four months; in coughing.	Dr. R. J. Hodge	Author.
	Five months; in vomiting.	Dr. J. D. Maxwell	Author.
	Six months; in coughing.	Dr. J. C. Lettsom	Pettigrew's Memoirs of Lettsom's Life and Writings, iii. 82, London, 1817.
Emetics and other remedies	Eight months; in coughing.	Dr. A. H. Thompson	Boston Med. and Surg. Journ., 1853.
	Nine months.	M. Maslhierural-Lagemard	Amer. Journ. Med. Sciences, N. S., iii. 476.
	Twelve months; in coughing.	Mr. Travers, Jr.	Medico-Chirurgical Trans. of London, xxiii. 116.
Purgatives, antimonials, anodynes, &c.	Thirteen months; in coughing.	Dr. Craigie	Craigie's Pathological Anat., 590, Edinb. 1848.
	Fifteen months; in coughing.	Dr. G. R. Henry	Iowa Medical Journal, i. 203, 1854.
	Twenty-two months; in coughing.	Dr. James Duncan	Northern Journ. Med., Aug. 1845.
	Two years; in coughing.	Dr. J. M. Nooth	Trans. Med. and Chir. Society of London, iii. 1. 1812.
	Two years; in coughing.	Dr. Herrick	Amer. Journ. Med. Sciences, N. S., xiii. 512.
Antiphlogistic and palliative	Nearly three years; in coughing.	Dr. Austin Flint	Author.
	Upwards of four years; in coughing.	Dr. James Duncan	Northern Journ. Med., Aug. 1845.
	Six years; in coughing.	Dr. Gridley	American Medical Recorder, xiii. 473.
Opiates, purgatives, and other remedies	Seven years.	Professor Walther	Graefe and Walther's Journ. der Chirurgie, in American Med. Recorder, vi. 571.
	Nine years and a half; in coughing.		Provincial Med. and Surg. Journ., Sept. 1843.
	Sixty years; in coughing.	Dr. R. Bartlett	Lee's New York Journ. Med. and the Collat. Sciences, vi. 23.

NARRATIVE OF CASES OF SPONTANEOUS EXPULSION, FOLLOWED BY RECOVERY, AND MENTIONED IN THE PRECEDING TABLE.

Case 1.—*Piece of nut; girl, aged two years and a half; emphysema of the neck; convulsions; failure of emetics; ejection in a fit of coughing three days after the accident, and discharge by stool; recovery.* (Dr. J. Reiche, Rust's Magazin für die gesammte Heilkunde, B. 27, 1828.)[1]

On the 7th of December, 1824, Dr. J. Reiche was called to see a little child, aged two years and a half, who, the preceding evening, while crying, had inhaled a piece of nut, followed immediately by so violent a fit of coughing as to threaten suffocation. After a time the paroxysm went off, but the child was restless, and wheezed a little in breathing. About nine o'clock, however, that evening, she became so ill that a physician was sent for, who, considering the case as one of croup, ordered leeches to the neck, to be succeeded by emetics and other remedies. On the following morning emphysema made its appearance on the neck and chest to such an extent as to render it difficult to feel the larynx and trachea.

At noon, when Dr. Reiche first saw the child, the breathing was somewhat hurried, and about every quarter of an hour she took an inspiration so slow as to occupy from fifteen to twenty seconds, and accomplished with the most extraordinary effort and distress. The little patient, in fact, appeared to be dying, and yet the succeeding expiration always brought a perfect calm, interrupted only by a slight cough, without expectoration, or anything special. The vesicular murmur was not heard at all at the upper part of the right lung, and below it was feeble. Between the cartilages of the second, third, and fourth ribs a whistling noise was perceived; the voice was shrill, and the pulse was soft and slow.

Taking into account the above facts, Dr. Reiche was induced to believe that a foreign body had entered the windpipe, and accordingly proposed tracheotomy, which, however, was strenuously resisted by the parents. To palliate inflammation and bronchial irritation, leeches were applied to the right side of the chest, the child was vomited, and a dose of calomel and extract of hyoscyamus was given, along with demulcent drinks. Two days after the accident the cough was so severe as to excite convulsions; the parox-

[1] Johnson's Medico-Chirurg. Rev., New Series, vol. x. p. 517, New York, 1829.

ysms of dyspnœa returned every five or six minutes; the wheezing was very loud, and there was an increase of the emphysema. To meet these symptoms, calomel and hyoscyamus, digitalis, ipecacuanha, sulphuret of antimony, syrup of senega, a blister, and bitter almond water were employed. This was on the 9th. On the 10th, after a convulsive fit of coughing, a calm ensued, and the child fell asleep. The whistling noise disappeared, and in the afternoon the piece of nut was discovered in the stools. The emphysema gradually subsided, and in three weeks had altogether vanished. In short, the child speedily recovered. Dr. Reiche supposes, and that very justly, that during the last attack of coughing the foreign body was ejected from the windpipe, and swallowed with the mucus which had been so abundantly secreted during the preceding twenty-four hours.

Case 2.—*Sixpence; man, aged thirty-five; violent cough, suffocation, and copious discharge of blood from the windpipe; lodgement of the coin, at first, in the larynx, and, afterwards, in the right bronchial tube; ejection at the end of a few days in dreaming; recovery.* (Mr. Edward Cock, London Medical Gazette, New Series, vol. i. p. 554, 1845.)

In this case a sixpence slipped down the throat, at first lodging in the larynx, and subsequently descending into the right bronchial tube. The accident was instantly followed by the most violent coughing and the most distressing sense of suffocation, accompanied with a copious discharge of blood from the air-passages. On his admission into the hospital, the man was still struggling for breath, coughing incessantly, and suffering great pain and irritation, which he referred to the larynx, where the coin seemed to have lodged. Shortly after this the sixpence left the larynx, and passed into the trachea; its change of position being immediately followed by an abatement of the previous urgent symptoms. He still, however, coughed almost incessantly, stated that he could feel the sixpence moving up and down the windpipe, and complained of pain and soreness in the chest, in the direction of the right bronchial tube, and also just below the larynx. Towards the close of the same evening the symptoms subsided, and he went to sleep. On the next day he was in much the same state, and as long as he remained calm and quiet, he complained of nothing but a feeling of general soreness along the larynx and trachea. The same evening the sixpence was thrown out without surgical aid. "I was asleep," said the patient,

"and dreamed that I was drinking a pot of porter, and the attempt to swallow it made me cough. I awoke, and found the sixpence in my mouth." It is evident, as Mr. Cock remarks, that the coin in this case was ejected from the bronchial tube while the muscles of the glottis were in a state of repose, and thrown off their guard.

Case 3.—*Damson-stone; girl, aged ten years; ordinary symptoms; emetics and anodynes; spontaneous ejection on the fourth day, in a fit of coughing; recovery.* (Mr. H. G. Harbord, London Med. Gazette, vol. xxiii. p. 672.)

A girl, aged ten years, having swallowed a damson-stone, was brought a few minutes after to the Liverpool Dispensary, in a state approaching asphyxia. Her cheeks and lips were of a livid hue, her eyes appeared starting from their sockets, and the assistant respiratory muscles were in violent action; in a word, death from suffocation seemed to be at hand. Two fingers being thrust into the throat, a violent attack of vomiting took place, attended with the ejection of the contents of the stomach. An immediate remission of the symptoms ensued, the breathing becoming free, and the child expressing herself relieved. Three hours afterwards, she was brought back to Mr. Harbord, her symptoms being renewed with aggravated intensity, and her efforts at coughing incessant. As the vomiting had been of so much service, an emetic of sulphate of zinc was administered, with the effect of relieving the distress. The respiratory murmur over the right side was indistinct, while over the left it was puerile. Whenever the girl coughed, the stone was moved from its position, and the sounds of respiration presented varieties according to its situation. Presently, a violent paroxysm of coughing ensued, and the stone being again propelled into the larynx, the symptoms were renewed, but soon subsided. She was sent home, and ordered frequent doses of an opiate demulcent; she rested well during the night, and the next morning played about the house, having occasionally a slight cough. From the sounds of respiration, it seemed that the stone was impacted edgewise in the right bronchial tube, a little below the bifurcation of the trachea. During three successive days, she presented the symptoms of a mild bronchitis. On the morning of the fourth day, during a violent fit of coughing, the stone was ejected, along with a considerable quantity of mucus streaked with blood. The bronchitis soon subsided, and the girl recovered her usual health.

Case 4.—*Grain of corn; girl, aged six years; spontaneous expulsion on the fifth day, in a severe paroxysm of coughing: recovery.* (Communicated to the author by Dr. W. Stapp, of Lewisport, Kentucky.)

Dr. Charles Haines was called to a girl, aged six years, whom he found to be affected with a frequent cough, attended with hurried and difficult respiration. On applying his ear to the chest, he discovered, opposite the bifurcation of the trachea, an unusual sound, which, together with the history of the case, satisfied him of the existence of a foreign body. The case progressed, becoming gradually more and more aggravated, until the morning of the fifth day, when, in a severe paroxysm of coughing, she ejected about two-thirds of a grain of parched corn, very slightly softened, and partially enveloped in mucus. The child rapidly improved after this happy riddance, and soon entirely regained her health.

Case 5.—*Grain of roasted corn; boy, aged five years; spontaneous expulsion at the end of the ninth day, in a fit of coughing; recovery.* (Communicated to the author by James D. Maxwell, M. D., of Indiana.)

This case occurred in the practice of Dr. McPheeters, in the summer of 1852. The patient was a lad, about five years of age, the son of Mr. L. The foreign body was a grain of a roasted ear of corn. The child, when found, was alone in the woods near the house, and was supposed to be suffering under an epileptic fit. The true nature of the case was not ascertained until the next day, when the attendant could distinctly hear the body passing up and down the windpipe. Emetics were given, but without relief. A week subsequently, in a paroxysm of coughing, the grain was thrown up.

Case 6.—*Piece of charcoal; boy, aged fourteen years; cough and dyspnœa, followed by inflammation; emetics and other remedies; obstruction in the right bronchial tube; ejection of the substance about ten days after the accident, in a paroxysm of coughing; recovery.* (Dr. Nathan Allen, Boston Med. and Surg. Journal, vol. xxxviii. p. 195. 1848.)

A boy, fourteen years old, while engaged in some sports, swallowed a piece of charcoal. The effects were such as generally attend this accident. Several days after his throat became very sore; he had violent fits of coughing, and, at times, difficulty of breathing, with bloody expectoration. Fever and bronchitis supervened. The voice was now hoarse and shrill, the respiration stridu-

lous, and the cough convulsive. The distress in breathing was greater during expiration than during inspiration. A mucous rhonchus was very distinctly heard over the right side of the chest; and the boy complained of pain and soreness in the corresponding bronchial tube. Supposing that riddance could not be effected by the operation of tracheotomy, Dr. Allen contented himself by treating the case upon general principles. He accordingly employed emetics, venesection, antimonials, and mercurials, with, however, but little benefit. Things continued much in the same manner until one morning, about ten days after the accident, when, in a violent paroxysm of coughing, accompanied with copious expectoration, the piece of charcoal was ejected. It was completely coated with mucus, and was of firm consistence, uneven in form, and about the volume of a small chestnut. The fever, cough, and dyspnœa, immediately subsided, and the patient recovered in a few days.

Case 7.—*Cockle-bur; lad, aged thirteen years; violent coughing and dyspnœa; expulsion on the thirteenth day, in a fit of coughing; recovery.* (Communicated to the author by Dr. M. Pyles, of Louisville.)

Thomas S. Johnston, of Louisville, aged thirteen years, in October, 1838, while amusing himself with some boys on the ice, gathered some cockle-burs, of which he put several in his mouth. In a moment after, they all started on a race, and in the act of taking a deep inspiration, one of the burs suddenly slipped into the youth's windpipe. The most violent cough, attended with extreme difficulty of breathing, immediately ensued, and continued incessantly for several hours. He then became easier, and rested tolerably well for some time. The cough now became irregular and spasmodic, and, just before each paroxysm, his countenance always assumed a most anxious expression; he would grasp, at these times, any one that happened to be near him, maintaining his hold until the fit passed off. His distress in these attacks was so great that his family despaired of his life, thinking that they would inevitably suffocate him; he rested badly at night, and had a haggard, careworn look. Thus things progressed until the morning of the thirteenth day, when, in a fit of anger, he suddenly sprang up in bed, and in an instant coughed up the foreign body. The bur was of medium size, and was completely incrusted with thick tough mucus, which effectually concealed its spines, and, doubtless,

greatly aided its expulsion. A slight cough remained for a few days after this happy riddance, when all the pulmonary symptoms subsided, and the general health became rapidly re-established.

Case 8.—*Cherry-stone; man; expulsion in three weeks, in a fit of coughing; recovery.* (Bonetus, Med. Septentr. Collat. lib. ii. sect. ix. De Affect. Asperæ Arteriæ, cap. ii.)[1]

A man having mounted a ladder to eat some cherries from a tree, felt it giving way under him, and in his alarm a kernel of the fruit slipped into his windpipe. The accident was immediately followed by cough and difficulty of breathing. The surgeon who saw him, not being able to discover the stone, and the difficulty of respiration having ceased, supposed that the cough under which he labored was owing to a catarrhal flux to which he was subject, in consequence of having exposed himself to the rain in the morning. The cough lasted three weeks, and at times greatly exhausted the patient; he had, moreover, a severe pain in the side. At length, one night, after coughing violently for an hour, he spat up the cherry-stone enveloped in mucus, and immediately recovered from his pulmonary troubles.

Case 9.—*Horseshoe nail; boy, between two and three years of age; choking and violent cough, followed by night-sweats and emaciation; abnormal flatness over the whole chest, and loud mucous râle in both lungs; expulsion about the end of the fourth week; recovery.* (Dr. J. Mason Warren, Boston Med. and Surg. Journ. vol. xxxvii. p. 392, 1847.)

On the 10th of May, 1846, a little boy, between two and three years of age, while playing with a hammer and some horseshoe nails, allowed one of the latter to slip into the windpipe. He was immediately seized with choking and violent cough. The cough for a time subsided, but soon returned with symptoms of slight pneumonia, which lasted a week. At the end of this period, as the boy was lying over a chair with his head downwards, a sudden clucking noise was heard, as if some substance had been thrown from the lungs up into the windpipe, and was at once followed by a paroxysm of suffocation, threatening instant destruction. Placed erect, the obstruction was removed, and he became better. Subsequently he experienced two similar attacks, each being caused by

[1] Louis's Second Memoir on Bronchotomy, in Ottley's Selection from the Memoir of the Royal Academy of France, p. 269, Lond. 1848.

the dependent position of the head. In the intervals he had a hoarse cough, and finally became affected with night-sweats, loss of appetite, and emaciation. At certain parts of the day, particularly towards evening, there was much mucous rattling in the chest.

Dr. Warren first saw the child three weeks after the accident. He was now rapidly failing from the irritation of the lungs, and it was evident that something must be attempted for his relief. The whole chest emitted a flatter sound than natural, and there was a loud mucous râle in both lungs, but a little more marked in the left than in the right. In the course of the next six days the boy had four attacks of suffocation from the ascent of the foreign body into the windpipe. The last came on while he was at dinner, and was so sudden and violent that he fell back as if he had been shot. It was with great difficulty that he was recovered from its effects. A few days after this, while Dr. Warren was making preparations for opening the trachea, he discovered, to his surprise, that the mucous râle had almost disappeared, and, upon inquiry, he learned that the cough had been much less during the last forty-eight hours, and also that there had been no severe suffocative symptoms since the attack just alluded to. The body was now inverted, to ascertain if the foreign substance could be dislodged, but without effect. The fauces were also thoroughly explored and even irritated with a quill, with no better success. Under these circumstances the operation was of course declined. Dr. Warren heard some months afterwards that the child was in good health, having had no return of his former symptoms.

There is every reason to believe that the nail in this case was ejected during the last attack of suffocation, which came on so suddenly while the child was at dinner, and which was so severe as almost to destroy him. As he lay upon the floor, apparently dead, the mother seized with her fingers the tough and stringy mucus protruding from his mouth, and as she was pulling it away it seemed to unwind itself from some substance in the throat. This was doubtless the nail, which was dragged up into the fauces, whence it was swallowed, and, finally, after having produced severe pains in the bowels, voided at the end of the second day after the last violent attack of suffocation. At all events, after this period the child seemed to be entirely relieved both in his lungs and in his alimentary canal.

Case 10.—*Part of a grain of corn; girl, aged six years; spontaneous expulsion at the end of five weeks; recovery.* (Communicated to the author by James D. Maxwell, M. D., of Indiana.)

Dr. Maxwell was visited in the autumn of 1846, by Mrs. H., of Gosport, Indiana, for advice relative to her little daughter, aged six years. Four weeks previously she had got a part of a grain of corn into her trachea, followed by spasmodic coughing and other urgent symptoms usual in such cases. Emetics were employed by the medical attendant, but without any benefit. Gradually, the child became emaciated; the cough was very distressing, and there was copious expectoration. Having on several former occasions witnessed the good effects of delay, Dr. Maxwell sent the little patient home, with directions to use an expectorant for the bronchial irritation. The result justified his expectations. In about a week the substance was expelled, and the child soon regained her health.

Case 11.—*Piece of wood; boy, aged eleven years; body moving up and down the windpipe; expulsion on the thirty-fifth day in a paroxysm of coughing; recovery.* (Dr. Houston, Dublin Hospital Reports, vol. v. p. 598, 1830.)

A boy, eleven years old, a patient of Dr. W. Plant, of Ireland, while chewing some wood, let a piece, about the size of a sixpence, and a line in thickness, fly into the trachea. He coughed violently for three days, particularly at night, and complained of pain low down in the right lung. For four weeks he was perfectly free from constitutional disturbance, though his pulmonary symptoms continued. At the end of this period he had a violent fit of coughing, after which the pain in the side ceased, and he felt something in his throat. On examining him, Dr. Plant detected the foreign body moving up and down the trachea. As the child's suffering was much relieved, it was determined to wait for the spontaneous expulsion of the piece of wood, which happily occurred, during a paroxysm of coughing, at the expiration of the thirty-fifth day from the accident.

Case 12.—*Piece of bone; man, aged thirty; cough and dyspnœa; emetics and expectorants; expulsion at the end of the thirty-seventh day, in a paroxysm of coughing; recovery.* (Dr. T. Arnot, Edinb. Medical Essays, vol. v. part 2. p. 613.)

David Hedderwick, aged thirty, began to complain, on the 28th of April, 1733, of difficulty of breathing, cough, fever, want

of appetite, and a sense of constriction at the upper part of the sternum, which were increased by exposure to wet. He was bled and vomited; but, with the exception of the tightness in the chest, the symptoms continued as before. Pleuritic pains set in, the flesh and strength declined, the pulse was frequent and irritable, the breath was very fetid, and the respiration was attended with a wheezing noise. He remained in this condition, notwithstanding the repeated employment of the lancet, emetics, and expectorants, until the 3d of June, when, in a severe fit of coughing, lasting about three hours, he ejected a piece of spongy, fetid bone, about the size of a hazel-nut, along with a large teaspoonful of very fetid and bloody pus. His symptoms immediately became milder, and he gradually regained his health. The precise moment of the ingress of the foreign body was not known; but the accident was supposed to have happened at the date above specified.

Case 13.—*Piece of cedar, and piece of silk thread; girl, aged seven years; cough and dyspnœa; pulmonary abscess; spontaneous expulsion of both substances at different periods; recovery.* (The author.)

Miss Molly C., aged about seven years, the daughter of a highly respectable gentleman of Memphis, Tennessee, on Friday, the 17th of September, 1852, while playing in a garden at Lexington, Kentucky, accidentally swallowed a sprig of cedar, which, from the account of the child and her mother, must have been nearly two inches in length by one inch in breadth. The substance seemed to descend with great difficulty along the œsophagus, but after several attempts at deglutition it finally reached that organ, and the symptoms of choking which accompanied its passage immediately subsided. From that time on, however, until late in November, she was daily harassed with a dry, hacking cough, which was always most troublesome at night and during recumbency. She complained of a constant tickling in the upper part of the larynx, which greatly aggravated her distress, and which required the frequent use of expectorants for its relief. On the 3d of October she took cold, followed by an increase of her suffering. She was now affected with fever, which had hitherto been absent, and the cough became incessant and exceedingly alarming. Under the use of emetics and expectorants, however, these symptoms lost their intensity, and she remained comparatively comfortable, except that she experienced some difficulty in swallowing from inflammation of the throat. For

the relief of this affection, her attendant, Dr. Pawling, of Danville, applied nitrate of silver.

While the case was thus progressing, the child, on the 21st of October, in the afternoon, inhaled a piece of thick red sewing-silk, four inches and five-eighths in length, which she happened at the time to be chewing or holding in her mouth. No increase of laryngeal, bronchial, or pulmonary embarrassment attended this second accident; but during the evening she was seized with frequent and violent paroxysms of cough and suffocative feelings, attended with severe pain in the lower part of the left lung, shifting, in a few days, to just above the nipple, where it afterwards remained fixed, extending, however, occasionally up towards the clavicle, and outwards towards the axilla. A careful examination of the corresponding side of the chest, at this period, revealed the existence of pneumonia. On the 24th of October, in a violent paroxysm of coughing, she ejected a piece of *cedar*, of a firm consistence, and of characteristic appearance, but of a brownish color, and scarcely one line in length. The *thread* (Fig. 2), was expelled,

Fig. 2.

in a similar manner, on the 7th of November; it was rolled up into a small flattened mass, bearing the indentations of the teeth, and slightly covered, upon one of its surfaces, with whitish lymph, or inspissated mucus. The cough, from the time the thread was inhaled until its expulsion, reappeared every afternoon, about five o'clock, and lasted until towards midnight, when the child usually fell into a tolerably sound sleep, waking up in the morning nearly well, and so continuing during the greater part of the day. The fever, which was at first of an inflammatory character, gradually assumed a hectic type, and was always followed by pretty copious sweats. The child expectorated a great deal of fetid pus, commencing soon after the inhalation of the thread, and continuing until the 25th of November, when it finally ceased. Whenever she ejected this kind of matter, she complained of a peculiar burning sensation in the armpit of the affected side.

Three days after the fetid expectoration disappeared, she was seized with a violent and protracted paroxysm of coughing, in which she ejected a small body, about the size of a partridge shot, and probably, from its resemblance to the other foreign body, a piece of cedar.

During the progress of the case, the child was troubled with pain and irritation of the bowels, which, after the expulsion of the silk thread, assumed a dysenteric form, and finally disappeared, after a fortnight, under the use of nitrate of silver. It is worthy of notice that the cough ceased as soon as the enteritis subsided. It was never discovered when the sprig of cedar, which was, doubtless, the cause of the intestinal disease, was voided.

On the 10th of December, when I first saw this patient, she was laboring under the effects of a slight cold, contracted on her journey from Danville to this city. She had a frequent spasmodic cough, and symptoms of subacute bronchitis, which yielded promptly to mild treatment. She had still some pain, with a sense of burning, in the left side of the chest, and absence of the respiratory murmur just above the left nipple, over a space about two inches and a half in diameter.

Case 14.—*Water-melon seed; girl, aged six years; body moving up and down the trachea; spontaneous extrusion at the end of the fortieth day; recovery.* (Communicated to the author by James D. Maxwell, M. D., of Indiana.)

Leonora H., aged six years, a resident of Monroe County, Indiana, in 1850, while running up a hill in the act of eating a piece of water-melon, drew one of the seeds, during a hurried inspiration, into the windpipe. The symptoms at the time were of the usual character, and the body moved freely to and fro with an audible click. A neighboring physician administered emetics, but with no benefit as far as the ejection of the intruder was concerned. The seed in a few days became stationary, and such was the amelioration of all the symptoms that it was thought probable it had been expelled unobserved. This improvement continued for about four weeks, when the child was supposed to have contracted a cold; the cough returned, and the seed, being dislodged, was heard again passing up and down the windpipe. Several days subsequently, Dr. Maxwell was called to the patient in consultation. The substance was once more stationary; the cough was dry and hack-

ing, and there was considerable fever. After full deliberation, it was deemed best to leave the case to the restorative efforts of nature, prescribing merely a febrifuge and palliative for the cough. In the course of a week the seed was expelled, and the patient soon recovered.

Case 15.—*Plate of brass metal; child, two years and a half old; cough, dyspnœa, and complete aphonia; expulsion at the end of six weeks, in a paroxysm of sneezing; recovery.* (Dr. C. Bannister, Boston Med. and Surgical Journ., vol. xxxvi. p. 142. 1847.)

A child, two years and a half of age, had the misfortune, on the 18th of September, 1846, to swallow a plate of brass metal (Fig. 3), used for covering the end of a spool of thread, three-fourths of an inch in length, and three-eighths of an inch in breadth at its widest part, the angle at one of the extremities of which had been accidentally bent into a kind of hook, rendering it a very unpleasant morsel for the air-passages. From the absence of severe and well-marked symptoms, it was supposed, for a short time, that the substance had descended into the œsophagus; but the medical attendant was soon undeceived by the accession of cough, and difficulty of breathing, resembling croup. The cough after awhile abated; but the dyspnœa continued, and was followed by emaciation and total aphonia. These symptoms lasted six weeks, when the child accidentally sneezed and threw up the extraneous body. Laborious respiration, accompanied with a wheezing sound between asthma and croup, remained after the windpipe was freed; though convalescence was taking place when the case was reported in March, 1847.

Fig. 3.

Case 16.—*Three artificial teeth, with their block and two wooden pivots; gentleman; copious purulent expectoration; ejection at the end of the forty-sixth day, in a fit of coughing; recovery.* (Dr. Thomas Wallace, Boston Med. and Surg. Journ., vol. xvi. p. 206. 1837.)

On the 10th of February, 1837, Dr. T., of Derry, New Hampshire, drew into his trachea, whilst in the act of coughing, three artificial teeth, on one block, with two wooden pivots, which had accidentally separated from his jaw, and lodged, as was supposed, near the bifurcation of the right bronchial tube. Here they remained forty-six

days, when they were coughed up with about half a teacupful of purulent matter. The symptoms, during the first week, were, occasional irritative cough, difficulty of breathing, and soreness in the right side. After that period, he had severe paroxysms of coughing in the morning, with expectoration of from a pint to a pint and a half of greenish pus in the twenty-four hours. The breath was fetid throughout; and for the last fortnight he had felt the irritation from the teeth very sensibly while coughing. For nearly a month after their expulsion, he raised about eight ounces of matter a day; notwithstanding which his health and strength were gradually increasing. The length of the teeth and pivots was five-eighths of an inch, and the breadth of the block seven-eighths of an inch.

Case 17.—*Piece of bone; girl, ten months old; cough, dyspnœa, and saw-like noise in breathing; expulsion at the end of the forty-eighth day, in a fit of coughing; recovery.* (Mr. Thomas Stabb, London Medical Gazette, for December, 1830.[1])

Mr. Thomas Stabb, the reporter of this case, states that, on the 20th of September, 1830, S. H. S., aged ten months, while playing with a bone of a neck of mutton, put it into her mouth, and detached a small portion, about the size of a large marrow-fat pea, which slipped into her windpipe, and produced violent coughing and irritation for about five minutes, when it ceased, leaving a noise in breathing like that caused by a saw. These symptoms recurred with increased severity the next day, accompanied with constitutional excitement. The same saw-like noise of breathing and some cough continued, but did not appear to give pain after the fourth day; the child's health and spirits after that time appearing as good as usual, except this constant wheezing.

On the 3d of November, upwards of six weeks after the accident, in consequence of exposure, violent tracheal irritation, with cough, returned. To relieve these symptoms, antimony was given; and on the 7th, while the system was relaxed from the effects of this medicine, and while the nurse was briskly rubbing the throat with a volatile embrocation, the head being bent back over her lap, the child was seized with a violent fit of coughing, and threw up the piece of bone, imbedded in mucus. Her breathing almost immediately became natural, and the next day she was as well as ever.

[1] Amer. Journ. Med. Sciences, vol. vi. p. 251. Phila., 1830.

The piece of bone was very rough, with sharp edges, and of a triangular shape.

Case 18.—*Patient's own molar tooth; girl, from ten to twelve years of age; cough and dyspnœa; expulsion at the end of the sixth week; recovery.* (J. B. Borsieri, Institut. Medicin. Pract. 3, cap. 17. Leipsic, 1786.[1])

In this case, the first molar tooth, extracted by a surgeon, slipped from the forceps into the throat, whence it was carried into the glottis, the patient narrowly escaping suffocation. After the lapse of some hours, during which there was an agonizing struggle between life and death, the tooth passed the larynx, and lodged in the lower part of the windpipe, with considerable relief to the patient, who was now distressed only by a very harassing cough, attended with a constant wheezing and rhonchus. Subsequently, the girl experienced pleuritic pain and fever, and raised some blood with her sputa. The cough was never absent, and the difficulty of breathing was always worse at night, the exacerbation appearing regularly as soon as the patient went to bed and assumed the horizontal posture, the tooth being then, as it seemed, carried higher up towards the larynx. About the end of the sixth or seventh week from the time of the accident, the tooth was ejected in a violent fit of coughing.

Case 19.—*Ear of grass; girl, aged eleven years; purulent and fetid expectoration; expulsion on the fiftieth day, in a fit of coughing; recovery.* (Dr. W. Donaldson, Edinb. Med. and Surg. Journ., vol. xlii. p. 102. 1834.)

Miss E. F., aged eleven, on the 1st of August let an ear of grass slip into her windpipe. She was immediately seized with a fit of coughing, which almost choked her. Her pulmonary distress continued in a mitigated form, attended with derangement of the stomach and bowels, until the 4th of September, when she began to throw up purulent matter, which was so offensive that the smell was almost insupportable. She also experienced, for the first time since the accident, some pain in the chest, similar to what might be produced by some rough substance passing up and down behind the sternum. On the 19th of September, she had a violent paroxysm

[1] Dr. Craigie, Edinb. Med. and Surg. Journ., xliii. 380.

of coughing, when she brought up a head of grass, accurately represented in the adjoining sketch (Fig. 4). The pulmonary symptoms gradually subsided, and perfect recovery ensued.

Fig. 4.

Case 20.—*Piece of the kernel of a walnut; boy, nearly four years old; croupy cough, most frequent and severe in the night and morning; expulsion at the end of the fifty-second day; recovery.* (Dr Craigie, Edinb. Med. and Surg. Journ., vol. xlii. pp. 106–379. 1834.)

H. S., nearly four years of age, about seven weeks and a half ago, swallowed a piece of the kernel of a walnut, the accident being followed immediately by violent coughing, which continued to recur in fits for several hours. When seen by his medical attendant, Dr. Scott, two days after, there were, along with general distress and feverishness, anxious breathing, and absence of respiration in the right lung, with some sonorous rattle in the corresponding bronchial tube, and puerile respiration in the left lung. The fits of coughing soon assumed a croupy character, and became more frequent and severe in the night and morning; the expectoration consisted of a dense, opaque, puriform mucus; the pulse kept at about 140; and there was considerable wasting of flesh and strength, but no nocturnal sweats. At the end of about fifty-two days, the patient was seized with a violent paroxysm of coughing, threatening suffocation; and in a few minutes after, he suddenly ejected the foreign substance (Fig. 5), with nearly an ounce of puriform mucus. For four days previous to this occurrence his health seemed to be improved; he had less cough and fever, and less anxiety and pectoral distress. His recovery was complete.

Fig. 5.

CASE 21.—*Piece of bone; male, aged seventy years; symptoms of pneumonia; protracted cough, and anasarca of the feet and legs; expulsion at the end of eight weeks in a fit of coughing; recovery.* (Communicated to the author by Dr. R. M. Dunlap, of Danville, Kentucky.)

A gentleman, aged seventy years, in the spring of 1849, was seized with a cough, which continued to increase for about eight weeks, when, in a severe paroxysm of this kind, he threw up a piece of bone, of the volume and nearly of the shape of a front tooth. From this time on he gradually regained his strength, his cough entirely left him in a few weeks, and he ultimately completely recovered. During the time the foreign substance was in the windpipe he had a troublesome and harassing cough, with some of the symptoms of pneumonia, and he expectorated large quantities of tough, ropy mucus, but no purulent matter. His feet and legs had begun to swell, he was much prostrated, and, in short, he exhibited all the evidences of approaching dissolution.

CASE 22.—*Leaden bullet; boy, aged five years; violent cough and difficulty of breathing; emetics; spontaneous ejection eight weeks after the accident; recovery.* (Communicated to the author by James D. Maxwell, M. D., of Indiana.)

James T., aged five years, of Owen County, Indiana, got a bullet into his windpipe while playing with it in his mouth. The bullet was of the size of about 120 to the pound. The usual symptoms, such as violent cough, and difficulty of breathing, occurred at the time of the accident. Emetics had been administered, but without benefit. The paroxysms becoming more frequent, the boy was brought to Bloomington to Dr. Maxwell and Dr. McPheeters for advice. Upon examination, it was evident that the bullet was stationary in the left bronchial tube, immediately at its commencement, fitting no doubt accurately its caliber, as there was no respiratory murmur on that side. There being no imminent danger, and guided by the results of former experience in regard to the expulsion of smooth substances, the advice of these gentlemen was, unless the symptoms should become much aggravated, to intrust the case to the efforts of nature, aided by such a position of the body, when a paroxysm of coughing came on, as would favor the escape of the bullet by its own gravity. In a fit of coughing, while in this attitude, about eight weeks after its intromission into the trachea, the

object was ejected with considerable force, and the child was soon well.

Case 23.—*Puff-dart; young man; great dyspnœa and frequent cough; lodgement in the left bronchial tube; abscess of the lung; spontaneous expulsion, during a fit of coughing, two months after the accident; recovery.* (Mr. R. S. Nunn, Prov. Med. and Surg. Journ., July 25, 1849.)

Henry Taylor, a stout florid young man, a groom by occupation, was admitted into the Essex and Colchester Hospital at half-past five o'clock in the afternoon of the 1st of March, 1845. He was suffering from great dyspnœa, and short, frequent cough, attended with pain in the upper part of the sternum. His breathing was hurried and difficult, the countenance was anxious and suffused, and the pulse was eighty-four in the minute. He stated that an hour previously, while playing at a game called "puff-dart," in taking a deep inspiration preparatory to blowing the dart through the tube, he inhaled the projectile, which was formed of a nail, wrapped round at one end with worsted, and of which the accompanying cut is an

Fig. 6.

accurate representation. On applying the stethoscope, the only specific sign distinguished was a loss of the respiratory murmur on the left side, with dulness on percussion, particularly in front. The sounds on the right side, on the contrary, were perfectly natural. Considerable fever supervened, attended with expectoration of glairy mucus, occasionally streaked with blood, anxious countenance, and difficulty of breathing; but these symptoms gradually subsided, and by the 17th of April the health had so far improved that the man was made an out-patient.

Mr. Nunn did not see Taylor again until the evening of the 2d of May, when he was requested to visit him in great haste. He found him in a state of extreme collapse, covered with a cold, profuse perspiration; his breathing was scarcely perceptible, and he was

pulseless at the wrist. Upon inquiry, it was ascertained that he had been suddenly seized with a violent fit of coughing, in which he had ejected nearly a quart of pus along with the puff-dart.

Stimulants being administered and heat applied to the extremities, the patient gradually rallied, and finally completely recovered, being able to do the work of an able-bodied laborer. The pulse slowly diminished in frequency, the expectoration by degrees disappeared, and the shortness of breath and pain in the left side at length entirely subsided, although they had annoyed him for a long time.

Case 24.—*Piece of butternut shell; a very young child; difficulty of respiration; expulsion upwards of five months after the accident; recovery.* (Dr. Charles Smith, Boston Med. and Surg. Journ., vol. xxii. p. 318, 1840.)

A child, less than one year of age, of Westfield, New England, inhaled a piece of butternut shell, one-fourth of an inch in length by half an inch in circumference, and somewhat of an oblong shape, which was coughed up spontaneously, after having been in the wind-pipe from the 31st of December, 1839, until the 6th of June, 1840. The little patient was seized with suffocation at the moment of the accident, and had difficulty of respiration nearly during the whole period of the retention of the extraneous body. When the case was reported by Dr. Charles Smith, of Ohio, the child was seventeen months old, and in the enjoyment of good health.

Case 25.—*Fragment of a cherry-stone; boy, aged fourteen; violent cough and dyspnœa; ejection of the substance at the end of sixty-eight days; formation of an abscess in the left lung, with collapse of part of the organ; copious discharge of pus; recovery.* (Dr. John Webster, London Medical and Physical Journal, vol. 56, p. 430. 1826.)

George R., aged fourteen, hitherto in the enjoyment of excellent health, inhaled a broken cherry-stone, followed by a most violent fit of coughing, accompanied by great difficulty of breathing, and a sense of instant suffocation. He had also severe pain and a slight swelling at the top of the trachea. The patient was first seen by Dr. Webster twelve days after the accident, when he was informed that the above symptoms had continued without intermission, and even in a more aggravated form; there was also a constant darting pain under the sternum, extending towards the left side, the boy could lie only on the left side, and on sitting up the difficulty of breathing and sense of suffocation were increased.

From an examination with the stethoscope it appeared that the foreign body was situated in the left bronchus, at the bifurcation of the trachea, thereby obstructing almost entirely the passage of air into the left lung, which, however, was sound. The corresponding side of the chest was dull on percussion, whereas on the right side everything was natural. There was constant palpitation of the heart; the system was feverish; his rest was much disturbed by violent fits of coughing without expectoration; and the pulse was 120, small, and sharp. Sixteen leeches, and afterwards a blister, were applied to the chest; a mixture of squills, antimony, and nitrous ether was given internally, and the child was restricted to very low diet. On the sixteenth day, considerable relief was experienced; but the cough, pain in the chest, and laborious breathing still continued. Blood was now taken from the arm to the amount of six ounces, and another blister was applied to the chest, followed by slight improvement for a short time; but four days afterwards the symptoms were nearly as bad as before. The patient had but little sleep, and could lie only on his back, feeling as if about to be suffocated whenever he attempted to move. Six leeches were applied to the lower part of the sternum, at the left side; and the medicines were continued as before, with the addition of half a grain of digitalis at each dose. On the twenty-second day, the cough was not so violent, but still frequent and paroxysmal, without expectoration; the breathing was considerably embarrassed, and the pulse was full, rather hard, and 120 a minute. The bleeding of the arm was repeated to eight ounces, and the medicines were continued.

From this period to the sixty-eighth day the symptoms varied very little; the cough, though alleviated, was never absent; the pulse was constantly quick; there were occasional rigors, denoting the formation of matter; and the strength was so much reduced that the boy was hardly able to move.

The stethoscope was frequently employed, to ascertain the state of the thoracic viscera, and on the thirtieth day the air appeared to pass freely into the left lung, particularly into the upper lobe; but the lower one was still collapsed, leading to the supposition that the stone had descended further down the bronchial tube, so as to remove the obstruction from some of the superior branches.

The same plan of treatment was pursued as at first; leeches and blisters were repeatedly applied, and the patient was kept exceedingly low and tranquil. Early on the morning of the sixty-eighth

day, he felt as if he were about to be suffocated; with pain extending to the upper part of the neck and left shoulder, followed by sickness and violent fits of coughing, during which he expectorated more than a pint of fetid pus, mixed with streaks of blood, and containing the broken cherry-stone. Great exhaustion ensued; but in a few hours he became more comfortable, and although he threw up matter copiously for a week, he gradually recovered, being able to walk out on the twentieth day after the ejection of the foreign body, and being perfectly well three months after the accident.

The patient in this case, doubtless, owed his life to the judicious treatment of his physician. Had he not been most carefully watched, and repeatedly bled, leeched, and blistered, the probability is that the pneumonia consequent upon the presence of the foreign body would have destroyed him. As it was, the morbid action was kept in check, until an abscess had formed, the contents of which were discharged along with the cherry-stone. That tracheotomy should have been promptly performed is, I think, unquestionable, though it appears to have been the opinion of Dr. Gregory, and of Messrs. Lawrence, Wardrop, Bacot, and others, who met Dr. Webster in consultation, and, indeed, of the latter gentleman himself, that it ought to have been resorted to only in the event of the most urgent symptoms, attended with the most imminent danger to life. I must confess it is difficult to conceive how the symptoms could have been more threatening; the lad might have perished in an instant from the dislodgement of the foreign substance, and its entanglement in the larynx; and, as it was, he was very nearly lost by the hectic irritation and profuse discharge. I cannot, therefore, agree with the narrator that "the successful termination of the case justified the practice which was adopted."

Case 26.—*Grain of coffee; child, aged twelve months; violent and suffocative cough, followed by hectic fever; pneumonia; substance playing up and down the windpipe; fruitless exhibition of emetics; expulsion, at the end of three months, in a paroxysm of coughing; recovery.* (Communicated to the author by Dr. John W. Clark, of Mount Hope, Alabama.)

A child, aged twelve months, having been sick for some time, was suddenly seized, on the 2d of April, 1852, while playing with parched

coffee, with violent and suffocative cough. The history and symptoms of the case rendering the diagnosis clear, tracheotomy was proposed by a neighboring physician, but overruled by the parents of the child. An emetic was then administered, and in a few minutes, several grains and pieces of grains of coffee were thrown up, with some alleviation of the symptoms.

During the next twenty-four hours, the patient was comparatively quiet, and the hope was indulged that the foreign body had been expelled. At the expiration of this time, however, the symptoms recurred with all their former violence, and were soon succeeded by inflammation of the right lung, which was successfully combated by the ordinary remedies. Upon applying the ear to the chest and neck, however, it was found that this organ did not properly perform its function, and that, whenever the child coughed, some substance could be distinctly heard playing up and down the trachea.

The violent symptoms continued to recur paroxysmally. Diarrhœa, colliquative sweats, and hectic irritation at length set in; the patient became gradually emaciated; and the expectoration, free and muco-purulent, was streaked with blood. Stimulants and nutritious food constituted the principal items of the treatment. Finally, on the 6th of July, a little more than three months after the accident, the child, in a violent fit of coughing, ejected a grain of coffee, swollen much beyond its natural dimensions, but without any appearance of decomposition. All the disagreeable symptoms gradually subsided, and a perfect recovery was the result.

Case 27.—*Piece of hazel-nut; man, aged nineteen; ordinary symptoms, followed by hectic fever, and frequent expectoration of blood; ejection, at the end of three months, in a paroxysm of coughing; recovery.* (Author.)

W. S. Wilson, aged nineteen years, formerly of Louisville, while cracking a hazel-nut between his teeth, allowed half of the shell to pass into his windpipe. The accident would probably not have happened, had not a friend struck him suddenly and unexpectedly upon his back; the fright thus occasioned caused him to take a deep and hurried inspiration, during which the substance in question descended into the air-passages. The usual train of symptoms followed. The cough was frequent as well as violent, and a loud

wheezing noise could always be heard in both lungs. The patient complained of constant soreness and tenderness in the left side of the chest, just below the nipple; and, as the case progressed, he became gradually emaciated, suffering under hectic irritation, night-sweats, and copious purulent expectoration, often intensely fetid, and mixed with blood. These symptoms continued with but little variation until three months after the occurrence of the accident, when, in a paroxysm of coughing, the foreign body was expelled. The general health immediately began to improve, and the young man at length entirely recovered. The piece of shell had very sharp edges, and had undergone some change in its color.

Case 28.—*Tin whistle; boy, aged fourteen years; probable lodgement of the substance in the left bronchial tube; symptoms slight; ejection at the end of one hundred and four days; recovery.* (Communicated to the author by Dr. Frank H. Hamilton, Professor of Surgery in the University of Buffalo.)

On the 27th of May, 1852, Kirk Peck, of Arundel, New York, aged fourteen years, inhaled, while running, a tin whistle. The whistle was composed of two pieces of tin, each about one inch in length by one fourth of an inch in breadth, slightly bent in their longitudinal axes, and laid together at their concave surfaces. They were wound with silk tape and silk thread. The annexed cuts (Fig. 7), afford an accurate representation of them; *a* giving a front, and *b* a side view, without the thread.

Fig. 7.

The lad breathed with difficulty immediately after the accident, but in a few minutes the whistle descended lower down into the trachea, and he was relieved. He coughed slightly, but the intelligent gentleman in attendance could not, at first, detect any abnormal sounds in respiration, and the air seemed to pass freely into both lungs. Professor Hamilton saw him five days after the accident. No air was then admitted into the left lung, except immediately after coughing, when there was a "rushing" sound. He coughed pretty frequently, occasionally expectorating a little blood with the

mucus. There was some pain in the lower portion of the left lung. Most of the time, the breathing was easy, and without any feeling of constriction. There was some pain in the larynx, but none in the left bronchial tube, the seat of the whistle. The lad had always been healthy, except that he had had an occasional cough. He had a slight chill on the first of June, but none the next day. Taking into consideration the history and circumstances of the case, Professor Hamilton refused to operate.

On the 27th of August, three months after the accident, while rolling some sacks of wool, and making considerable exertion, the whistle came up to the larynx, but immediately fell back. Two or three days after, he had some fever, with chills, and an aggravation of his cough.

On the 7th of September, while making some violent muscular efforts, the whistle again came up, and was instantly thrown from the larynx into the mouth. A portion of the silk thread had disappeared, and the edges of the tin were quite bright, but roughened. It had remained in the lungs one hundred and four days, and during most of the time had occasioned but little inconvenience. The lad soon recovered his health completely; but several months after, he was suddenly attacked with croup, and died. No autopsy was made.

Case 29.—*Nail; man, aged sixty-five; excessive emaciation; constant spitting of blood; fixed pain in the right lung; ejection of the extraneous body, in a fit of coughing, nearly four months after the accident; recovery.* (Mr. John Howship, Practical Observations in Surgery and Morbid Anatomy, p. 222. Lond. 1816.)

James Butler, aged sixty-five, while working on a ceiling, on the 15th of April, allowed one of two nails, which he had in his mouth, to slip into his windpipe. Incessant irritation, pain, and cough immediately followed, and continued until the man was worn away to a skeleton; he had spitting of blood and mucous phlegm. The prescriptions that were made early after the accident mitigated his sufferings, but did not remove them. Numerous physicians were consulted, and they all considered the case to be hopeless. The pain, and, in fact, all his distress, from the beginning to the close of the case, were fixed in the right lung, at a spot which could be exactly covered with the hand. The spitting of blood continued to recur

at intervals, and the symptoms gradually grew worse, until the 12th of August, when, after a copious hæmoptysis, attended with a sudden fit of coughing, the nail (Fig. 8) was violently ejected into the mouth, its head being rusted. The man was seen eleven years after the accident, in the enjoyment of pretty good health; subject, however, to occasional cough, slight spitting of blood, and a painful sensation precisely in the old spot.

Fig. 8.

Case 30.—*Piece of bone; girl; constant cough and fever, with spitting of blood; expulsion at four months, in a fit of coughing; recovery.* (M. Louis, Second Memoir on Bronchotomy.[1])

This case was copied by Louis from Stalpart Van-der-Wiel; but whether it fell under that author's observation or not, it is not in my power to state, as I have not been able to refer to his works. A girl, whose age is not given, in swallowing some broth, let a small bit of the bone of a shoulder of veal slip into the windpipe. She immediately experienced a good deal of inconvenience from the occurrence. The foreign body having descended into the lung, kept up constant cough and fever, followed by spitting of blood and ulceration of the affected organ, as evinced by the character of the sputa and other symptoms. At length, after four months, she coughed it up with the expectoration, and subsequently entirely recovered, although she had been threatened with consumption.

Case 31.—*Water-melon seed; boy, aged five years; laryngeal symptoms, simulating croup; approaching marasmus; ejection at the end of four months after the accident in coughing; recovery.* (Dr. M. S. Perry, Descriptive Catalogue of the Anat. Museum of the Boston Society for Medical Improvement, by Dr. J. B. S. Jackson, p. 119. 1847.)

The patient having, while playing in the garden, inhaled a water-melon seed, came into the house to his mother, laboring, as she supposed, under croup, caused by cold. The symptoms for a time were such as to favor this idea, and the case was treated accordingly. After awhile Dr. Perry was called in, and took charge of

[1] Observations on Surgical Diseases of the Head and Neck; selected from the Memoirs of the Royal Academy of Surgery of France, by Drewy Ottley: p. 268. London, 1848.

the child. He found the voice very hoarse and shrill, and there was a frequent and strongly laryngeal, though not urgent, cough, with slow, noisy, and laborious respiration. The boy was unable to lie down in bed, and there was tenderness on pressure about the larynx, with enlargement of the neighboring glands. Meanwhile, the general health became affected, and the child was fast passing into a state of marasmus, when, at the end of four months from the time of the accident, the foreign body, the presence of which had never been even suspected, was suddenly expelled during a fit of coughing: complete recovery was the result. There is a strong probability, from the nature of the symptoms, especially the state of the voice, that the melon seed was lodged in the larynx.

CASE 32.—*Piece of bone; girl, aged seventeen years; fruitless exhibition of emetics; hectic fever; ejection, at the end of four months, in a fit of coughing; recovery.* (Dr. Dicke, Rust und Casper's Repertorium der Gesammte Heilkunde, B. 17, s. 427. Berlin, 1827.)

On the 4th of October, 1823, a girl, aged seventeen, inhaled into the windpipe a piece of bone, three-quarters of an inch in diameter. A severe croupy cough, difficulty of breathing, and lividity of the countenance were the immediate results, and continued, with intervals of comparative ease, for twenty-four hours. A few days subsequently the girl became feverish, and was seized with violent pain in the right side and at the lower part of the sternum, aggravated by coughing. The expectoration consisted of mucus, mixed with blood. Bleeding at the arm, tartar emetic, hyoscyamus, and other remedies were employed for the relief of these symptoms. A short time afterwards, and when the fever had considerably abated, an emetic was administered, but did not effect the expulsion of the foreign substance. At the end of November, hectic fever set in, with a marked increase of the general debility. On the 6th of February, 1824, in a violent paroxysm of coughing, accompanied with a discharge of mucus, blood, and pus, the bone was ejected. The girl now began to improve rapidly, and under the use of Iceland moss and other means, prescribed by Dr. Dicke, of Wesel, she completely recovered.

CASE 33.—*Water-melon seed; young man; asthmatic symptoms; spontaneous expulsion at the end of about four months, in a fit of coughing; recovery.* (Communicated to the author by Dr. R. J. Hodge, of Smithland, Kentucky.)

A young gentleman, now a student of law, some years ago, while eating a piece of water-melon, allowed one of the seeds to slip into the windpipe. Violent spasmodic cough and suffocative feelings were the immediate consequences of the accident. A sense of uneasiness was for some time experienced in the larynx, but there was not much pain after the first few days. The voice was somewhat altered, the breathing was much embarrassed, and there was constantly a peculiar wheezing noise, similar to what occurs in asthma. Numerous physicians were consulted, but no effort was made to remove the foreign body by operation. At the end of about four months after the accident, in a violent fit of coughing, the seed (Fig. 9) was expelled from the windpipe, followed by instantaneous relief of all the bad symptoms and the rapid recovery of the patient. The seed seemed to have been enlarged and slightly softened by the fluids of the air-passages.

Fig. 9.

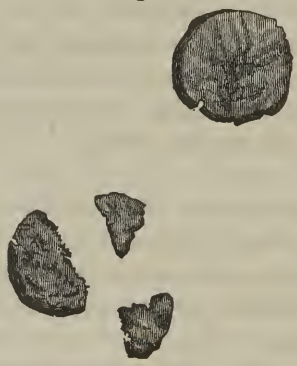
CASE 34.—*Water-melon seed; girl, aged fourteen years; harassing cough, copious expectoration, and emaciation; ejection of the body, during an attack of spontaneous vomiting, upwards of five months after the accident; recovery.* (Communicated to the author by James D. Maxwell, M. D., of Indiana.)

A girl, aged fourteen years, was brought to Dr. Maxwell in 1842, on account of a harassing cough, copious expectoration, and considerable emaciation. Her friends supposed her to be wasting with consumption. Upon inquiry, it was ascertained that the cough was of five months' duration, and that it was probable, from some antecedent circumstances, that it had its origin in the presence of a foreign body in the air-passages. Some general directions, and a prescription for the compound solution of iodine being given, the patient returned home. In a week, she had an attack of intermittent fever. During the cold stage, spontaneous vomiting took place, followed by the expulsion of a water-melon seed, which was imbedded in tenacious mucus. The pulmonary annoyance promptly vanished, and a perfect recovery was the result.

Case 35.—*Button-foil; lad, aged ten years; symptoms of phthisis; expulsion in about six months, in a fit of coughing; recovery.* (Dr. J. C. Lettsom, in Memoirs of his Life and Writings, by Dr. Pettigrew, vol. iii. p. 82. Lond. 1817.)

Alexander Sinclair, aged ten years, accidentally inhaled, early in October, 1783, the foil of one of the buttons of his coat. His symptoms, at first, were severe cough, considerable hoarseness and dyspnœa, with acute pain at the upper part of the sternum. High febrile excitement followed, and during the winter he had copious expectoration and profuse night-sweats. In the spring of 1784, he embarked for Jamaica, and during the voyage, in a violent paroxysm of coughing, ejected the button covering. From the appearances exhibited in Fig. 10, the probability is that it came up in detached fragments.

Fig. 10.



Case 36.—*A half peanut; child, aged one year; unsuccessful employment of emetics; expulsion of the foreign body eight months after the accident, in a violent fit of coughing; recovery.* (A. H. Thompson, M. D., Boston Med. and Surgical Journal for 1853.)

A child, one year of age, while amusing itself with a handful of peanuts, was suddenly seized with violent coughing and a harsh, croupy respiration. Dr. Thompson saw it immediately after the accident, and as the urgent symptoms had already subsided, he contented himself with the exhibition of an emetic and the suspension of the body by the heels. Severe pneumonia came on forty-eight hours afterwards, requiring the most energetic measures for its suppression. In a few days the disease passed off, leaving merely an occasional paroxysm of coughing and some dyspnœa, with a rattling

noise during expectoration. At times, the difficulty of breathing was very distressing. Various remedies were employed for the expulsion of the substance, but without success. Finally, on the morning of the 16th of July, 1853, eight months after the accident, and after an unusually severe paroxysm of coughing, it was thrown from the windpipe to a distance of upwards of five feet. It proved to be the half of a peanut, without its shell, measuring three-fifths of an inch in length by three-fourths of an inch in circumference. The cough and dyspnœa immediately subsided, followed by perfect recovery. Dr. Thompson remarks that, during nearly all the time the foreign body remained in the windpipe, the child was exempt from urgent symptoms, being happy and playful.

Case 37.—*Cherry-stone; woman, aged fifty-eight years; spontaneous ejection at the end of nine months; recovery.* (M. Maslhieurat-Lagemard, American Journal Med. Sciences, N. S., vol. iii. p. 476.)

The subject of this case was a woman, fifty-eight years old, who, when first seen by Dr. Maslhieurat-Lagemard, had been laboring under a cough for four months. At the commencement of the attack, the fits were violent and accompanied with a sense of suffocation. When she consulted her physician at the time above mentioned, the cough recurred every eight or ten days, lasting for a few minutes, and being unattended with fever or expectoration. The patient could assign no cause for the attack, and nothing could be learned by auscultating the thorax. The symptoms continued without aggravation or mitigation, and finally, at the end of nine months, she ejected, along with some mucus, a rough, yellowish calculus, about the size of a filbert. On sawing the calculus, it was found to consist of calcareous matter, incrusted on a cherry-stone. The woman then recollected that the first attack of cough occurred when she was eating cherries, but she was not conscious that she experienced any suffocative sensation at the time. She remained perfectly well after the expulsion of the concretion.

Case 38.—*Cowdrie shell; girl, aged twelve years; absence of symptoms for several months; expulsion twelve months after the accident, in a fit of coughing; recovery.* (Mr. Travers, Jr., London Medico-Chirurg. Transactions, vol. xxiii. p. 116.)

A girl, aged twelve years, whose case was communicated by Dr. Paris to the younger Mr. Travers, of London, having put a small

cowdrie shell into her mouth, was seized with a violent choking fit, in consequence, as was supposed, of the extraneous body having passed into the windpipe. A most severe and alarming spasmodic paroxysm supervened, and continued for several seconds, when it ceased, the breathing becoming perfectly natural, and all inconvenience vanishing. The father of the girl had thrust his finger down her throat; a circumstance which afforded immediate relief, and induced the opinion that the piece of shell had passed into the stomach. In the course of four or five days, a slight cough came on, but it had nothing of an unusual character, and readily yielded to the ordinary remedies. About three weeks after this period, the cough returned; it was now much more violent, and was accompanied with some hæmoptysis. This, however, again subsided, and she remained for several months in perfect health; the breathing was never disturbed, the pulse was normal, and she indulged in her usual active habits and daily exercise. About one year after the accident, while dancing at a ball, and while in the act of moving briskly, she was suddenly attacked by a violent spasmodic cough and sense of suffocation, followed by the forcible expulsion of the remnant of the shell, the animal substance of which had entirely disappeared.

Case 39.—*Screw-nail; boy, aged five years; probable lodgement of the foreign body in the right bronchial tube; pneumonia, pleurisy, and bronchitis; temporary relief; change in the form of the chest; spontaneous ejection of the nail at the end of thirteen months, in a fit of coughing; recovery.* (David Craigie, M. D., Craigie's Elements of General and Pathological Anatomy, p. 590. Edinb. 1848.)

A healthy boy, aged five years, had an attack of measles in April, 1843, from which he made a very favorable recovery. Soon after, however, he was attacked by cough of extreme violence, which, notwithstanding the use of remedies, proceeded and became daily more urgent and distressing; the expectoration, at first scanty, was puriform, and occasionally somewhat streaked with blood; the boy was feverish, and he lost his flesh and strength. In May, 1843, Dr. Craigie was requested to see him. The respiration was now from thirty-two to thirty-six in the minute, with little or no motion of the upper part of the right side of the chest, and with manifest dulness on percussion all over the corresponding subclavicular, pectoral, and scapular regions. Air did not, during the motions of inspira-

tion, enter the right lung freely, but seemed to be stopped and thrown back at every attempt of the kind. The voice was a little resonant over the right mammary region, and there was pain in this part, stretching sometimes to the shoulder. On applying the ear to this region, the pulsations of the heart were heard as strongly, clearly, and distinctly, as in the natural situation of that organ. Occasionally, slight wheezing and faint mucous rattle were noticed immediately below the right collar bone and through the right scapula; and when the child coughed, the expiratory sound fell upon the ear at times faintly, and at other times very forcibly. The pulse was never under one hundred and twenty, and there were nocturnal sweats, with alarming and protracted fits of coughing in the morning. On the left side of the chest no morbid sounds were recognized, the air entering and quitting the lungs without impediment.

For the above symptoms leeches and blisters were applied several times to the right side of the chest, the bowels were regulated with castor-oil, or calomel and rhubarb, and the cough was moderated with antimonial medicines, with occasional doses of tincture of hyoscyamus. Under this treatment the patient gradually improved, and in July he was able to go into the country for change of air. He remained there for six weeks, gaining much health and strength; the cough left him, the expectoration ceased, and he recovered his wonted looks. He continued in this state during the early part of the winter of 1843–4. As the season advanced, however, the cough returned in a more violent form; and in March following, symptoms of another attack of catarrh appeared, attended with urgent cough, muco-purulent expectoration, night-sweats, and emaciation, with a pulse of one hundred and twenty in the minute. In short, the boy was very much in the same condition as in May, 1843. There was almost entire absence of motion on the right side; the mammary region emitted a dull sound, and was visibly flattened and depressed; the voice was resonant; the cardiac beats were as distinct as before; the respiration was nearly inaudible, especially over the upper portion of the right lung; the air seemed to penetrate only a short distance below the collar bone; the breathing was performed mostly by the diaphragm; and occasionally, only, was there a slight rattle. On the other hand, the respiration was clear and good over the whole of the left side. Dr. Craigie felt satisfied, at this time, that there had been pleuro-pneumonia, with considerable

effusion and consolidation, and that there was scarcely any respiration in the upper and middle lobes of the right lung.

The diet was now most carefully regulated, and pretty much the same treatment was employed as before. The symptoms, nevertheless, proceeded, being sometimes more intense, sometimes alleviated, but never absent. At length, after a long, violent, and distressing fit of coughing, on the morning of the 10th of March, 1844, the boy threw up an iron screw-nail, about three-fourths of an inch long, completely oxidized, and covered with purulent and bloody matter, its head having very sharp edges.

For a little while after the dislodgement of the nail, the cough seemed to be aggravated, and there was no immediate diminution in the expectoration; eventually, however, all the disagreeable symptoms disappeared, and the flesh and strength returned in the course of four or five weeks. The surface of the mammary region was still dull, and hardly any respiration was heard; but the chest was moving a little, and the child experienced no inconvenience. In July, he went again into the country, from which he returned in a short time free from any apparent complaint. From the history of the case, Dr. Craigie justly concludes that the nail had been lodged in the right bronchus, and that it must have been retained at least thirteen, if not fourteen or fifteen months. Not the least remarkable circumstance connected with it was the decided abatement in the symptoms, in June, 1843, followed by temporary recovery, which continued during the ensuing autumn and winter, while the foreign body was still fixed in the bronchial tube.

Case 40.—*Water-melon seed; girl, aged three years; secondary symptoms obscure; pneumonia; spontaneous ejection at the end of fifteen months in a fit of coughing; recovery.* (Dr. G. R. Henry, Iowa Medical Journal, vol. i. p. 203. Keokuk, Iowa, 1854.)

The following case has been recently reported by one of my former pupils, Dr. Greenbury R. Henry, of Burlington, Iowa:—

A little girl, three years old, was brought to Dr. Henry, on the 22d of September, 1852, on account of illness caused by the inhalation of a water-melon seed two weeks previously. A close examination was made, but, as no foreign body could be detected, an operation was declined, and the child was accordingly taken home. The symptoms of pneumonia, which existed at the time, rapidly disappeared, and the little patient gradually regained her accus-

tomed health, but was occasionally troubled with severe attacks of coughing. On the 13th of December, 1853, that is, fifteen months after the occurrence of the accident, the seed was ejected in a violent paroxysm of this kind, followed by the immediate subsidence of all the disagreeable symptoms.

"Had the child," says Dr. Henry, "been brought to me immediately after the accident occurred, I would have operated with much hope of success; for then the foreign body was loose, and, as her father expressed it, would 'flip' when she breathed; but when I saw her, there was no positive evidence that the seed had not been coughed up, and there was certainly great danger of increasing the inflammation which had already supervened."

Case 41.—*Head of grass; boy, aged five years and a half; embarrassed breathing, harassing cough, and purulent expectoration; expulsion twenty-two months after the accident, in a fit of coughing; recovery.* (Dr. James Duncan, Northern Journal of Medicine, August, 1845.)

A boy, five years and a half old, on recovering from a severe attack of pertussis, in 1840, was sent into the country for change of air. In the month of July, while in the fields, he had a head of grass in his mouth, which during the hoop in a fit of coughing was carried down into the trachea. The accident was soon succeeded by an attack of acute bronchitis, for which he was very actively treated, and from the effects of which he never thoroughly recovered. After the violence of the disease was subdued, he was constantly affected with rapidity of breathing, harassing cough, and purulent expectoration, occasionally streaked with blood. Emaciation succeeded, and hectic symptoms were supervening, when, one evening in the beginning of May, 1842, twenty-two months after the accident, during a very violent paroxysm of coughing, the ear of grass was ejected in a mass of thick, fetid pus. From this time all the urgent symptoms diminished in severity, and by degrees the boy perfectly recovered. The substance proved to be an entire ear, one inch in length, of the crested dog's-tail grass, the cynosurus cristatus of botanists.

Case 42.—*A shot; adult; asthmatic symptoms; expulsion at the end of about two years, in a fit of coughing; recovery.* (Dr. J. M. Nooth, Trans. Med. and Chir. Society of London, vol. iii. p. 1, 1812.)

The subject of this case was Dr. John M. Nooth, an intelligent English physician, by whom it was reported in the work above referred to. He was seized, while on duty at Quebec, with an asthmatic affection that annoyed him almost daily for many months; it was attended, at first, with a sense of weight and fulness in the left side of the chest, some pain, and difficulty of breathing; and, afterwards, with urgent cough, expectoration of dense mucus, irregularity of the pulse, and much anxiety and pectoral distress. Believing that a change of climate would be beneficial, Dr. Nooth went to London, where he arrived about two years after the commencement of his asthmatic attack. Soon after this event, while in a hot and crowded theatre, his cough became unusually severe, the respiration difficult, and the heart's action very irregular. Being very ill, he retired to bed, and, lying with his face downwards, he continued to cough and throw up phlegm. Towards morning, he discovered that he had ejected a large leaden shot, about one-eighth of an inch in diameter, with very speedy alleviation of all the distressing symptoms. In less than a fortnight the expectoration and cough had quite ceased, and the pulse had become regular. He was not certain how the shot had entered his windpipe, but he remembered that he was one day seized, immediately after drinking the last glass of a bottle of wine, with a convulsive cough, which he attributed, at the time, to the passage of some drops of fluid into the larynx. The shot had, doubtless, forced its way into one of the ramifications of the left bronchial tube.

Case 43.—*A fish-bone; man, aged twenty-five; cough, dyspnœa, and, at length, phthisical symptoms; expulsion upwards of two years after the accident, in a fit of coughing; recovery.* (Dr. Herrick, Amer. Journ. Med. Sciences, N. S., vol. xiii. p. 517.)

A carpenter, aged twenty-five, of good constitution, and robust health at the time, was suddenly attacked with cough, profuse expectoration, and difficult respiration, with slight febrile excitement. These symptoms, which were succeeded by loss of flesh and strength, gradually increased for two years, inducing the patient and his friends to believe that he was laboring under confirmed phthisis. Some time afterwards, during one of the violent fits of

coughing to which he was subject, a piece of fish-bone, cuboidal in shape, and at least half an inch in diameter, was suddenly and forcibly expelled from his windpipe, followed by a rapid subsidence of all the alarming symptoms and complete recovery. The patient, thus happily relieved, had, it would seem, some time prior to the appearance of the first attack of pulmonary embarrassment, while dining upon fish, inhaled, as he supposed, a small portion into the air-passages, but as it produced little trouble at the time, he thought no more of it, and did not, during his whole illness, even suspect the true cause of his suffering.

Case 44.—*Brass trunk-nail; girl, aged eight years; violent and harassing cough; pneumonia; hectic fever; expulsion nearly three years after the accident, in a fit of coughing; recovery.* (Communicated to the author by Professor Austin Flint.)

In March, 1846, a girl, aged eight years, was suddenly attacked with vomiting and coughing, together with severe pain near the centre of the left collar bone and about the same point of the fifth rib. There was free expectoration of bloody mucus, followed, in a few hours, by high inflammatory action. A physician, who saw the girl soon after, said that she was laboring under pneumonia. Under the influence of a blister and other antiphlogistic measures, the urgent symptoms gradually subsided, and in the course of ten days she was quite comfortable. The cough, however, continued to be troublesome, and, although she was able to be about the house, she seemed to be gradually sinking.

When Dr. Charles A. Baker, from whom Professor Flint obtained the particulars of the case, first saw the child, in November, 1846, she was laboring under an irritable, harassing cough, with slight expectoration, hectic fever, loss of appetite, great emaciation, prostration of strength, and general soreness through the chest. From the unpromising character of the symptoms, a mere palliative course was directed, consisting of mild expectorants, generous diet, cold bathing, and exercise in the open air. With the exception of an occasional cold, nothing of importance occurred during the winter months, and no change was made in the treatment. By spring, the health had so far improved that she was able to attend the district school, walking a distance of three-quarters of a mile and back. This she continued to do, with slight interruptions, through the summer. Dr. Baker saw her occasionally during the

two following years: her health was apparently good, with the exception of a paroxysmal cough, for which he rarely prescribed any medicine.

In February, 1849, the girl for the first time mentioned that she knew what ailed her. She said that at the time she was taken sick she was lying on the bed with a brass nail in her mouth, and that, while playing with the children, she accidentally swallowed it. About a week subsequent to this period, during a severe attack of coughing, she threw up the foreign substance, with a large quantity of mucus. Upon examination, it was found that it was a brass nail, formerly much employed for trimming trunks; the stem being bent to one side, and the whole completely discolored and partially corroded. It had been retained in the windpipe, probably in one of the bronchial tubes, within a few days of three years. The cough which had so long afflicted the patient soon ceased. When Dr. Baker saw her last she was thirteen years old, and in excellent health.

CASE 45.—*Piece of bone; man, aged forty-two; harassing and continued cough; inability to lie on the left side; expulsion a little upwards of four years after the accident, in a fit of coughing; recovery.* (Dr. James Duncan, Northern Journal of Medicine, Aug. 1845; also Am. Journ. Med. Sciences, N. S., vol. ii. p. 219.)

A gentleman, aged forty-two, early in February, 1841, while at dinner, swallowed a piece of bone. A violent paroxysm of coughing and difficulty of breathing followed, together with slight bloody expectoration, and a sharp pain in the left side of the chest, about three inches below the clavicle. These symptoms, with the exception of a somewhat troublesome cough, soon subsided, and the accident was forgotten. The cough increased, and resisted all the means that were employed for its mitigation. The patient could not rest on the left side, and he expectorated considerable quantities of mucus, tinged with blood, especially after exposure. The suffering continued, varying in intensity, until the spring of 1844, when it became very severe, but was alleviated by the use of tonics. During the winter months of 1845, the symptoms were again much aggravated, the patient being harassed by violent spasmodic cough, and unable to rest in any posture. On the 2d of March, 1845, he was seized with a severe attack of coughing, in which a small piece of bone was discharged. The paroxysm continuing, in about half an hour another and still larger piece was ejected. From this time,

the condition of the patient gradually improved; he began to rest well at night, and could sleep with ease on either side; but the cough was still kept up for some time during the day, and there was a discharge of a considerable quantity of muco-puriform fluid. He also for awhile felt the pain on the left side; but his strength improved, and in June, 1845, he was perfectly well.

The pieces of bone varied in size; the larger was of a rhomboidal figure, the diagonal between the two very acute angles measuring one inch, that between the obtuse angles three-quarters of an inch. The smaller fragment was somewhat curved, and was three-fourths of an inch in length by three lines in breadth.

Case 46.—*Lead pencil; boy, nine years of age; cough and dyspnœa; expulsion at the end of six years, in a fit of coughing; recovery.* (Dr. Gridley, Cayuga County, New York; American Med. Recorder, vol. xiii. p. 473.)

A lad, nine years old, accidentally swallowed a lead pencil, of a cylindrical shape, upwards of an inch and a half in length, and weighing fully one drachm and a third. Cough, a sense of choking, and dyspnœa ensued, but passed off entirely in a few days, without exciting any uneasiness in the parents of the child. Subsequently, these symptoms, which were ascribed to the presence of worms, frequently returned, and continued, with various intermissions, for a period of about six years. At the end of this time, while the boy was engaged, in company with his father, in sawing a log with a cross-saw, his body being considerably bent forward, he was seized with a paroxysm of coughing, in which he ejected the foreign body.

Case 47.—*Claw of a crawfish; youth, aged seventeen years; expulsion at the end of seven years, in violent coughing; recovery.* (Professor Walther, of Germany; Graefe & Walther's Journal der Chirurgie; Amer. Medical Recorder, vol. vi. p. 571; Chapman's Philadelphia Journal, vol. vi. p. 404.)

A youth, aged seventeen, applied to Professor Walther, in 1821, on account of phthisis, caused by the claw of a crawfish, which he had inhaled in 1811, and which had lodged, as was conjectured, in the right bronchial tube, occasioning violent cough, convulsions, and hæmoptysis. Under the use of opiates, assafœtida, purgatives, and other means, the cough ceased, and he became so much better that

he supposed the foreign body had been removed. The phthisical symptoms, nevertheless, continued, and up to 1814 he expectorated pus, and had repeated attacks of fever. Subsequently, he had convulsions, chorea, strabismus, optical illusions, and paralysis of the limbs; his expectoration at length became remarkably fetid; and in January, 1816, he lost his voice, sight, and hearing; but these he recovered again the succeeding summer. On the 27th of April, 1818, after coughing violently for several days, he brought up the claw of the crawfish, with a large quantity of pus, and from this time his health began gradually to improve. In 1821, he complained of pain in the side, and spit blood. He now tried the vapor of tar and sulphur, under the influence of which the expectoration ceased, and he regained his health.

Case 48.—*Beech-mast; girl, aged five years and a half; troublesome cough, and arrest of physical development; expulsion at the end of nine years and a half, in a fit of coughing; recovery.* (Provincial Med. and Surgical Journal, September, 1843.)

A girl, aged five years and a half, inhaled into her windpipe a beech-mast, which she accidentally held in her mouth at the time. The symptoms were such as ordinarily attend the introduction of a foreign body into the air-passages. The cough was troublesome and obstinate, and was at length succeeded by a discharge of pus, but by none of the constitutional phenomena of phthisis. After much suffering, for a period of nine years and a half, the extraneous substance was spontaneously ejected in a paroxysm of coughing. The girl recovered her health, but, the growth and development of the body having been arrested, she never attained her full size.

Case 49.—*Piece of bone; boy, three years old; symptoms variable; expulsion at the end of sixty years, in coughing; recovery.* (Dr. Rodman Bartlett, Lee's New York Journal of Med. and the Collateral Sciences, vol. vi. p. 23.)

Richard Moore, of Salisbury, Connecticut, now sixty-three years old, inherited a good constitution, but, at the age of three, he swallowed a piece of bone, which nearly suffocated him at the time, and which remained in the air-tubes until the 8th of October, 1845. For a long time he was harassed night and day with cough and severe dyspnœa, attended with sibilant rhonchus, fetid breath, and more or less pain deep in the right side, opposite the fifth and sixth ribs,

and midway between the sternum and spine. These symptoms continued to distress him until about the age of puberty, when he began to lose flesh, and to expectorate purulent matter, tinged with blood. At nineteen, he was suddenly attacked with hæmoptysis, which continued, at irregular intervals, for a long time, disqualifying him for business, and compelling him to remain constantly in the house for eight years. At twenty-eight, his general health began to improve, although he was still troubled with cough. During the next fifteen or twenty years, he was able to work some, suffering, however, all the time more or less inconvenience.

In 1844, for the first time since the accident, the cough suddenly left him, and did not return for several months, when it again began suddenly to harass him as before. On the 8th of October, 1845, he experienced a remarkably uneasy sensation, of a pricking nature, deep in the right side, which excited violent coughing, and, after one or two severe paroxysms, he felt as if something had given way. This was instantly followed by the passage of some substance into the trachea, producing suffocation, and by the forcible ejection of this substance upon the floor, succeeded by an expectoration of purulent matter streaked with blood. Upon examination, the foreign body was found to be a piece of bone, nearly three-fourths of an inch in length, one-fourth of an inch in breadth, and one-twelfth of an inch in thickness, of an oblong triangular shape, smooth and convex on one side, and rough on the other. From the traditionary accounts of the family, it appears that the bone which he had originally inhaled was a portion of rib, from which he was sucking the meat, and which had thus tormented him for sixty years.

SECTION III.

EXPULSION OF FOREIGN BODIES, FOLLOWED BY DEATH.

In the preceding section, an attempt was made to present an analysis of forty-nine cases of foreign bodies, in which the ejection, spontaneously occurring, was followed by the recovery of the patient. My object will be, in this section, to give a statement of the principal facts which have come under my notice respecting those cases in which this event has been succeeded by death.

The number of cases mentioned in the table as falling under

this head, are only eight. Others, however, will be noticed incidentally. The foreign bodies in these cases were, in one, a prune-stone; in two, a bone; in one, a cherry-stone; and in the others, respectively, a lath-nail, piece of cloth, a cockle-bur, and an artificial tooth.

In the first case, reported by Dr. Andriessen,[1] a boy, aged ten years, coughed up a prune-stone in a little less than three months, and died in nine days after from disease of the lungs, which, on dissection, were found to contain tubercles and caverns. The ordinary symptoms followed the introduction, and these were soon succeeded by those of pneumonia.

Lescure[2] gives an instance in which a man died three days after having expelled a piece of bone, inhaled ten months previously. The left lung was completely disorganized. The prominent symptoms were violent cough, pain in the left side, and spitting of blood, followed by great dyspnœa and an abundant fetid expectoration. The bone, which had sharp edges and angles, was nine lines in length, and was ejected in a prolonged and frightful paroxysm of coughing, attended with great pain and incredible exertion.

The case of the old monk,[3] at the Abbey St. Martin, near Treves, is well known. This man, after having suffered the most frightful distress for several hours, fell asleep, and afterwards experienced no further inconvenience for a whole year. At the end of this period, he was attacked with cough and fever, which became more and more threatening, until at length he ejected the foreign body, which was as large as a nutmeg, from having been incrusted with calcareous matter. Copious expectoration followed, and the patient expired some days after in a state of marasmus.

Mr. South, in his edition of *Chelius's Surgery*, gives the case of a man who had inhaled a lath-nail, which, after having excited frequent attacks of hæmoptysis, violent dyspnœa, and other pulmonary irritation, was forced up more than twelve months after the accident. The disease in the lungs persisted, and death took place some years after this apparently happy riddance.

An instance is mentioned by P. J. Pelletan[4] in which a man lost his life from pulmonary disease, caused by the introduction of a

[1] Wöchenschrift für die Gesammte Heilkunde, No. 48, 1837.
[2] Mémoires de l'Académie Royale de Chir. t. v. p. 353.
[3] Ephemerides Curios. Natur. Decad. ii. An. x. ob. lxvi. p. 123.
[4] Clinique Chirurgicale, t. i. p. 12. Paris, 1810.

piece of woollen cloth. It was coughed up at the end of several years, after an effort of three hours; and although the suffering was much alleviated, the suppuration, which had previously existed, continued, and produced death some time after.

The following case was communicated to me by Dr. J. H. Mc Gaughey, of Alabama. A boy, aged fourteen years, having inhaled a cockle-bur, ejected it in a violent fit of coughing two years and a half after the occurrence of the accident. For a time it caused but little uneasiness, but by degrees pulmonary disease, followed by a large abscess, set in, and caused death upwards of four years after.

A middle-aged lady, whose case is reported by Dr. Craigie,[1] of Edinburgh, inhaled, one evening in October, 1821, an artificial tooth, mounted on a pivot; and at length, after much suffering, and when the bronchial disease had become chronic, it was coughed up by expectoration on the 23d of May, 1824, after the lapse of two years and seven months from its descent into the windpipe. Notwithstanding this, the pulmonary malady continued, and the woman expired on the 1st of February, 1825.

But the most remarkable of these cases is that recorded by M. Lescure, in the *Mémoires de l'Académie Royale de Chirurgie* of Paris. The details are too long to be inserted here, and I must, therefore, refer the reader to the case itself, as given in another part of this volume. The patient was a girl, between eight and nine years of age, who, in eating a pigeon, swallowed a piece of the back-bone. The most violent cough and dyspnœa immediately supervened, and she felt a severe pain below the larynx behind the thyroid gland, which continued, with more or less severity, for seven years, when it shifted to the superior part of the chest. For the next four months she was free from dyspnœa. At the end of this period, she was suddenly seized with violent coughing and spitting of blood, amounting, at times, to a real hæmoptysis. The symptoms continued, now better, and now worse, until the age of twenty-four, when hectic fever and purulent expectoration appeared. After having remained in this condition for the next two years, she ejected the foreign body in a violent fit of coughing. It had been imprisoned altogether seventeen years. Considerable relief ensued, but the general health was frightfully deranged, and she died in a state of marasmus eighteen months after, having all along expectorated purulent matter.

[1] Edinb. Med. and Surg. Journ. vol. xlii. p. 105, 1834.

TABLE OF CASES OF SPONTANEOUS EXPULSION, FOLLOWED BY DEATH.

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	PREVIOUS TREATMENT.	TIME AND MODE OF EXPULSION.	TIME AND CAUSE OF DEATH.	MORBID APPEARANCES.	OBSERVER.	AUTHORITY.
1	Prune-stone	Male	10 yrs.	Ordinary; continuing for some time, and succeeded by peripneumonia, and, at length, by phthisis.		A little less than 3 mos.; in coughing.	9 days after ejection; from exhaustion.	Both lungs filled with tubercles and cavcrns; mucous membrane of the trachea softened and preternaturally vascular.	Dr. Andriessen	Wöchenschrift für die Gesammte Heilkunde, No. xlviii. 1837.
2	Bone	Male		Violent cough; fixed pain in the left side of the chest; spitting of blood; pneumonia; copious expectoration.	Various remedies	10 months; in coughing.	3 days after ejection; from pulmonary disease.	Left lung completely disorganized; foreign body lodged in a cavity in its substance.	M. Lescure	Mém. de l'Acad. Roy. de Chirurgie, v. 353.
3	Cherry-stone	Male		Violent coughing and retching; then perfect freedom from suffering for an entire year; at the end of this time hectic fever and copious purulent expectoration.		End of a year; probably in coughing.	Some days after ejection; from exhaustion.		M. Louis	Second Memoir on Bronchotomy.
4	Lath-nail	Male		Hæmoptysis for more than 12 months.		Upwards of 12 months.	Some years after ejection; from exhaustion.		Mr. Sutton	Chelius's Surgery, by South, iii. 112.
5	Piece of cloth	Male		Violent cough and symptoms of phthisis.		Several years: in coughing.	Death from pulmonary disease.		M. P. J. Pelletan	Clinique Chirurgicale, i. 12, 1810.
6	Cockle-bur	Male	14 yrs.	Severe and frequent cough, and finally symptoms of phthisis, followed by a large abscess which burst five weeks before death.		2½ years; in coughing.	Upwards of 4 years; from pulmonary disease.		Dr. J. H. McGaughey	Author.
7	Artificial tooth	Female		Harassing cough, dyspnœa, and finally symptoms of phthisis.		Upwards of 2½ years; in coughing.	Upwards of 8 months after ejection; from disease of the lungs.		Dr. Abercrombie	Dr. Craigie, Edin. Med. and Surg. Journ., xlii. 105, 1834.
8	Bone	Female	8 yrs.	Violent coughing; fixed pain below the larynx; periodical hemorrhage from the lungs; phthisis.		17 years; in coughing.	18 months after ejection; from pulmonary disease.		M. Lescure	Mém. de l'Acad. Roy. de Chir., v. 354.

NARRATIVE OF CASES OF SPONTANEOUS EXPULSION, FOLLOWED BY DEATH, AND MENTIONED IN THE TABLE.

CASE 1.—*Prune-stone; lad, aged ten years; ordinary symptoms; ejection in a little less than three months; death nine days after; tubercles and caverns in the lungs.* (Dr. Andriessen, Wöchenschrift für die Gesamm. Heilk. No. 48, 1837; Arch. Génér. de Méd. 3d series, 1, p. 219, 1838.)

A boy, aged ten, was attacked, on the 4th of December, 1836, with peripneumonia, caused by swallowing a prune-stone two months previously. The ordinary symptoms followed the introduction of the foreign body, and for some time after there was considerable respiratory difficulty. When Dr. Andriessen was called in, he supposed that the prune-stone had been ejected from the windpipe, and passed off by the bowels. The peripneumonia pursued its course, and was soon succeeded by all the symptoms of pulmonary phthisis. On the 2d of January, 1837, the child in a violent fit of coughing ejected the foreign substance. From this moment the cough became less frequent, and the respiration more free; but the disease had progressed too far, and proved fatal on the 11th of the month.

Both lungs were filled with tubercles and caverns; the trachea, just above its division, on its posterior surface, presented a spot corresponding in shape and size with the prune-stone, with softening and unnatural vascularity of the mucous membrane.

CASE 2.—*Piece of bone; man; fixed pain in the left side of the chest; spitting of blood; pneumonia, and copious expectoration; ejection at the end of ten months; death three days after; complete disorganization of the left lung.* (M. Lescure, Mém. de l'Acad. Roy. de Chir. t. 5, p. 353.)

A soldier at the garrison at Briançon, while sucking the marrow out of a piece of bone, was suddenly seized with a violent cough, accompanied with pain in the left side of the chest, and spitting of blood. Conveyed to the hospital, he was repeatedly bled, and treated as one affected with pleurisy. After some time he rejoined his regiment at Sedan, in March, 1766, in very cold weather. He entered the Military Hospital on the 22d of that month, laboring under great difficulty of breathing, frequent paroxysms of coughing,

and copious expectoration, the sputa being ash-colored and highly fetid. After having used in vain various remedies for his relief, he ejected, on the 29th of April, in a prolonged and frightful paroxysm of coughing, attended with great pain and incredible exertion, a piece of bone, of a triangular shape, nine lines in length at its longest part, very pointed at the corners, and sharp at the edges. From that moment the pain disappeared from the chest, the breathing became easy, the cough diminished in violence and frequency, and the expectoration was performed with facility. Notwithstanding all this, however, the patient died three days after this apparently happy event.

On opening the body, the right lung was found to be natural; but the left was completely disorganized. M. Lenglet, a surgeon at Sedan, who made the dissection, after having laid open the trachea in its whole length, found, about four inches below the bifurcation of that tube, on the left side, an abnormal cavity capable of holding a large nutmeg, in which the foreign substance had been lodged for ten months, and the situation of which had always been indicated, from the first moment of the accident, by a painful spot in the chest.

Case 3.—*Cherry-stone; old monk; violent cough, followed by a calm of one year, and then by phthisis; expulsion in about twelve months; purulent expectoration; death some days after ejection.* (Louis's Second Memoir on Bronchotomy.[1])

An old monk in the Abbey of St. Martin, near Treves, in attempting to swallow a cherry, was so unlucky as to let the kernel slip into the larynx. Violent coughing and retching, which the monk thought would kill him, were the immediate consequences. Recovering from this terrible agitation, he slept tranquilly for some hours, and afterwards experienced no further inconvenience from the accident for an entire year. At the end of this period he was attacked with cough and fever, which gradually increased in severity until at length he spat up a stone as large as a nutmeg. A copious purulent expectoration ensued, and the patient died some days after in a state of marasmus. The cherry-stone was incrusted with calcareous matter, which it had thus served as a nucleus.

[1] Observations on Surgical diseases of the Head and Neck; selected from the Memoirs of the Royal Acad. of Surg. of France, edited by Drewry Ottley, p. 277. Lond. 1848.

Case 4.—*Lath-nail; man; hæmoptysis; spontaneous ejection more than twelve months after the accident; partial recovery; death some years after from disease of the lungs.* (Mr. South, Chelius's Surgery, vol. iii. p. 112. Philadelphia edition.)

This case occurred in the practice of Mr. Sutton, of Greenwich, England. The man had frequent attacks of hæmoptysis for more than a twelvemonth, from each of which, however, he rapidly recovered. Upon the last occasion, he was summoned suddenly to see him, as he was supposed to be in a dying state. On his arrival, he found that the patient had had a very severe attack of dyspnœa and impending suffocation, from which he had been immediately relieved on ejecting from his windpipe a common lath-nail, much corroded. The man was a plasterer by trade, and now remembered that some time before he sent for Mr. Sutton, he had swallowed a nail whilst lathing a ceiling, but had thought no more about it till it was thrown up. He died some years after of diseased lungs.

Case 5.—*Piece of woollen cloth; man; violent cough, and symptoms of phthisis; expulsion at the end of several years; death from pulmonary disease.* (P. J. Pelletan, Clinique Chirurgicale, tom. i. p. 12. Paris, 1810.)

A patient, after having been sick for several years, applied for advice on account of an anal fistula and advanced pulmonary disease. One day, he was seized with a more violent cough than usual, with a desire to expectorate a body which seemed to him to be hard and of large volume; after an effort of three hours, he succeeded in throwing up a substance which was enveloped in earthy, mucous, and purulent matter, and which was found to be a piece of shaggy woollen cloth, of a triangular form, and about fifteen millimetres in length. Upon comparing this substance with the man's bedclothes, it was discovered that it was a portion of a blanket, which he had accidentally inhaled during his sleep, and which had thus given rise to his phthisical symptoms. Although the cough became less violent, yet the suppurative process continued unabated, and the patient at length expired.

Case 6.—*Cockle-bur; boy, aged fourteen years; expulsion of the substance two years and a half after the accident; formation of a large pulmonary abscess, followed by death upwards of four years after the ejection.* (Communicated to the author by Dr. J. H. McGaughey, of Gatesville, Alabama.)

A lad, aged fourteen years, inhaled a cockle-bur into his windpipe during a fit of laughter, whilst scuffling with his brother with it between his lips. It caused but little uneasiness at the time, but he thought that he could feel it behind the upper part of the sternum; after a severe fit of coughing, however, the following evening the sensation vanished, and never recurred. He continued to labor on the farm during the summer, but coughed always at night, and suffered from profuse sweats in consequence. For eighteen months his expectoration consisted of a tough mucus; after which it assumed a purulent character, and he became much emaciated and enfeebled. Two years and a half after the accident, in a violent fit of coughing, the bur was forced up into the nose, from which it was afterwards attempted to be removed, but without success. During the following night it was swallowed, and was subsequently voided by stool, unchanged in its appearance. Nearly seven years after the inhalation of this substance, the patient was attacked with severe pain in the right side, shifting about in different directions, and generally amenable to sinapisms. He now grew steadily worse, his dyspnœa became excessive, and in ten or twelve days from the commencement of the disease, an abscess which had formed in his lungs burst, and discharged an immense quantity of fluid. From this time he rapidly sunk, coughing incessantly, and expectorating profusely. He died about five weeks after the abscess broke, and seven years after the inhalation of the bur.

Case 7.—*Artificial tooth; middle-aged lady; frequent and harassing cough, followed by phthisical symptoms; expulsion at the end of two years and seven months; death, a little upwards of eight months afterwards.* (Dr. Craigie, Edinb. Med. and Surg. Jour. vol. xlii. p. 105, 1834.)

A lady, of middle age, under the care of Dr. Abercrombie and Dr. Maclagan, of Edinburgh, in the act of chewing a bit of oatcake, in October, 1821, detached an artificial tooth, which was forcibly swept into the windpipe. Much irritation of the larynx, with gasping, cough, and difficulty of breathing, recurring in fits, was the

consequence; and after the urgency of these symptoms subsided, frequent harassing cough, with tough mucous expectoration, quick pulse, and uneasiness in the chest ensued, and continued for several months. The treatment had merely a palliative effect, and the lady remained for a long time in a doubtful condition. At length, after much suffering, and when the bronchial disease had passed into the chronic state, the artificial tooth, (Fig. 11) was coughed up by expectoration on the 23d of May, 1824, two years and seven months after its descent. Much relief ensued in the pectoral symptoms; the cough became less frequent and urgent; the sense of weight in the chest diminished, the pulse fell, and the general health considerably improved. She continued, however, to cough, and to expectorate dense mucus, followed by some spitting of blood. In the latter part of 1824, the bronchial symptoms assumed a more serious character, and after much distress from cough and expectoration, she died, on the 1st of February, 1825.

Fig. 11.

CASE 8.—*Piece of bone; girl, between eight and nine years of age; retention of the substance for seventeen years, first in the trachea, and then in the bronchial tubes; periodical hemorrhage; spontaneous ejection; death, eighteen months afterwards.* (M. Lescure, Mém. de l'Academie Royale de Chirurgie, t. v. p. 354.)

A girl, between eight and nine years of age, in eating a pigeon, swallowed a piece of the back-bone, which descended into the windpipe, and she immediately experienced a severe pain below the larynx, behind the thyroid gland, and a most violent cough, which, however, soon subsided of its own accord, leaving merely a rattling and whistling noise, particularly distinct whenever she attempted to speak. Anodynes and expectorants failed to afford relief; the pain continued at the same spot, and could only be assuaged, whenever it became accidentally aggravated, as it sometimes did, by bleeding. In this condition she remained for seven years. At the age of sixteen she perceived a change in the situation of the pain, which now shifted to the upper part of the chest, the rattle and hissing at the same time disappearing. For four months she was free from dyspnœa; but at the end of this period she was suddenly attacked with violent coughing and spitting of blood, which lasted nearly two days, and were subdued by five bleedings, three at the arm and two at the foot. The hæmoptysis afterwards recurred

almost regularly every three months for five years: the attacks were always relieved by venesection, and, notwithstanding the frequent use of the lancet, there was no interruption of the menses. The general health was for some time impaired, but the hemorrhages became less frequent, and finally entirely ceased; the pain in the chest also diminished, and ultimately disappeared. The woman now rapidly improved in strength, and, being perfectly restored, she married at the age of twenty-one. She remained well for three years afterwards, being annoyed only occasionally by slight pain in the chest and bloody expectoration; but in her twenty-fourth year her health again began to fail; she lost her flesh and strength, and was teased with a dry cough, accompanied by hectic fever and purulent expectoration. In this condition she had remained for two years, when, in a very violent fit of coughing, she ejected the foreign body, after it had remained seventeen years either in the trachea or in the lung. She felt considerable relief in consequence; but her health was frightfully deranged, and she died in a state of marasmus eighteen months after, having all along expectorated purulent matter.

The symptoms in this extraordinary case would seem to show that the foreign body had been retained for the first seven years in the superior part of the trachea, either by the secretions of the part, or, what is more probable, by its having become infixed in the mucous membrane. Possibly, it might have been impacted in one of the ventricles of the larynx. Be this as it may, it was the opinion of M. Sue, who saw the case, that it might, during all this time, have been removed by tracheotomy. That such was the fact is highly probable, and it is only surprising that the operation was not performed. That the subsequent descent of the foreign body into the bronchial tube produced all the accidents which caused the death of the patient is certain; and it is not at all unlikely that, even after this event had taken place, an operation might still have been followed by the most happy results.

CHAPTER VII.

MEDICAL TREATMENT.

Under this head may be considered the various means that are employed for promoting the expulsion of the foreign substance, and preventing the mischievous effects which its presence is calculated to induce in the respiratory organs, as well as in the system at large. The former consist more especially in the administration of emetics, and the use of sternutatories; the latter, in the employment of the ordinary antiphlogistic remedies, as bleeding, expectorants, purgatives, and counter-irritation. Each of these topics will require separate consideration.

SECTION I.

EMETICS.

The exhibition of emetics has long been in vogue as a means of promoting the expulsion of foreign bodies from the air-passages. With whom the practice originated it would be difficult to determine; but the fact that it has been frequently resorted to with this view, is unquestionable. It would seem, at first sight, reasonable to suppose that emetics, if properly and timeously administered, could hardly fail to be useful in dislodging substances accidentally introduced into the windpipe, seeing how beneficially they act in clearing the bronchial tubes of mucus and pus in inflammatory affections of the respiratory organs. It was probably upon a knowledge of this circumstance that the idea of exhibiting emetics in cases of this kind was founded. Be this as it may, it is well known that the expectations thus raised have never been realized; for, in most of the cases in which these articles have been employed, disappointment has been the result; while, frequently, much valuable time has been lost in waiting for their effects. But

the above is not the only objection to the exhibition of emetics for the expulsion of extraneous bodies. In the act of vomiting, the intruder may be forced into the larynx, and thus seriously endanger the patient's life, as happened in several of the cases detailed in this work. Such an event would not be likely to take place if it were possible to prevent spasm of the muscles of the glottis; but, as we have no means of doing this, it admits of doubt whether this class of remedies should ever be employed.

One of the first cases in which this practice appears to have been successfully employed, is mentioned by Bonetus[1] as having occurred under the observation of Riedlinus. The patient was a young man, who, having inhaled a pea, immediately took a dose of oil, which vomited him, and caused the expulsion of the substance. He had labored under the greatest difficulty of respiration, and the most violent cough.

Verduc,[2] who was an advocate for the employment of sternutatories, either alone, or in combination with diaphoretic and volatile remedies, advised, in case these means failed, a prompt recourse to emetics. He also recommended that the neck and windpipe should be freely rubbed with liniments and ointments, in the belief that these substances would, by softening and relaxing the muscles and cartilages of the larynx, promote the expulsion of the extraneous body. It is to be regretted that this distinguished French surgeon has not furnished us with the particulars of his cases, or informed us whether he ever employed the practice which he so zealously recommends.

Hagedorn,[3] a practitioner of the seventeenth century, used emetics unsuccessfully in a case of this kind. His patient was a girl, who, in eating plums, got the kernel of one into the windpipe. The accident was followed by the most violent symptoms, threatening immediate suffocation; the voice was weak and hoarse, and the girl coughed up a large quantity of mucus, tinged with blood. Prompt recourse was had to emetics, aided by the exhibition of oleaginous and expectorant remedies, but without success. At length, very acrid and stimulating substances were administered, which excited the most violent cough, and thus facilitated the ejection of the kernel from the windpipe.

[1] Med. Sept. lib. 7, Paralelpom. adlib. 2, sect. 7, obs. 1.

[2] Pathol. Chirurg. t. ii. cap. 25.

[3] Bonetus, Med. Sept. lib. 2, de oris affect., sect. 9, cap. 2.

Dr. Horatio G. Jameson,[1] of Baltimore, refers to the case of a child, who, in the act of vomiting, threw up a water-melon seed that had been in the windpipe between four and five years. He does not state whether the emesis was spontaneous or artificial. In a case communicated to me by Dr. J. D. Maxwell, of Indiana, a girl, aged fourteen years, ejected, in a fit of vomiting consequent upon an attack of intermittent fever, a water-melon seed, which she had inhaled upwards of five months previously.

The subjoined cases, of which two were communicated to me by medical friends, afford additional evidence of the beneficial effects of the emetic treatment in this kind of accidents.

Case 1.—*Grain of corn; married woman; violent cough and pain in the side, followed by pneumonia; expulsion of the substance at the end of about three weeks, in a fit of vomiting induced by a febrifuge powder; recovery.* (Communicated to the author by Dr. W. Stapp, of Lewisport, Kentucky.)

A married woman sent for Dr. F. D. Lewis, in January, 1852, on account of a violent cough and pain in the left side, accompanied with soreness of the throat and high fever. Indeed, she had all the symptoms of pneumonia. She was advanced between four and five months in pregnancy. Her illness had commenced upwards of two weeks ago, in the form of a cold, followed by severe and continued coughing, for which she had taken the usual remedies. About four days after Dr. Lewis first saw her, she was seized with vomiting, caused by a febrifuge powder, and ejected from her windpipe what appeared to be a small tough clot of blood, but which, upon examination, proved to be a large grain of parched corn. She was greatly astonished at the circumstance, but soon recollected that she had eaten one evening, just before her illness, some of this substance, followed by violent coughing, which never ceased until after the expulsion of the body alluded to. The urgent symptoms gradually subsided, except the pain in the side, which remained for several weeks, though in a less degree. About four hours after the ejection of the corn labor set in, and finally terminated in a miscarriage.

[1] American Med. Recorder, vol. v. p. 677. Phila., 1822.

Case 2.—*Piece of hickory-nut shell; boy, aged twelve years; constant hacking cough and pain at the bifurcation of the bronchial tube, followed by emaciation; expulsion at the end of three months, during the action of an emetic; recovery.* (Communicated to the author by Dr. J. B. Thomas, of Hopkinsville, Kentucky.)

A boy, aged twelve years, residing near Scottville, Kentucky, one day inadvertently inhaled a piece of the shell of a hickory-nut, in his hurry to eat what he mistook for a part of a kernel of that fruit. Dr. Thomas saw him about twenty-four hours after the accident, and contented himself with prescribing an emetic, followed by anodyne expectorants, to allay cough and irritation. The time which intervened between the introduction and expulsion of the foreign substance was about three months. The prominent symptoms, during this period, when the lad was at rest, were increased frequency of breathing, constant hacking cough, and slight pain in the situation of the bifurcation of the trachea, together with considerable emaciation and loss of strength. During exertion, these symptoms were more plainly marked. The expectoration was trifling. At the expiration of the time above mentioned, Dr. Thomas was induced to prescribe another emetic, consisting of ipecacuanha and tartar-emetic, which caused free vomiting, in the act of which the hull (Fig. 12) was expelled. For some time after this event, the patient complained of soreness in the trachea, particularly about its bifurcation, for the relief of which he used mild purgatives, expectorants, and anodynes. A rapid recovery was the consequence.

Fig. 12.

Case 3.—*Stone; lad, aged ten; violent cough, dyspnœa, and inability to lie down; expulsion at the end of the fifteenth week, in a fit of vomiting; recovery.* (Dr. C. J. H. Ray, Lond. Lancet, vol. i. p. 488, 1835.)

A boy, aged ten, having a stone in his mouth, allowed it to slip into the windpipe. The consequence was an immediate sense of suffocation, succeeded by frequent and violent paroxysms of coughing, dyspnœa, profuse perspiration, and complete inability to lie in the horizontal posture. Dr. Ray first saw the patient about twelve weeks after the occurrence of the accident; he was then much emaciated, had frequent fits of coughing, with dyspnœa and copious frothy expectoration; was unable to run, or walk fast, and appeared much distressed in ascending the stairs. His pulse was small and frequent, and he had profuse perspiration. A mucous rattle, so

characteristic of subacute bronchitis, was distinctly heard on both sides of the chest; and in the right superior thoracic region a peculiar loud wheezing, as if caused by some uncommon obstruction, was evident. This noise occupied this particular spot until the expulsion of the foreign body, when it was no longer perceptible. Dr. Ray's treatment consisted chiefly of emetics of sulphate of zinc every other morning, for nearly three weeks. After having taken, one morning, a full dose of this article, attended with violent retching, the patient ejected the stone, which weighed half a drachm, and much resembled, in size and shape, a small date-stone. The period of its sojourn in the air-tubes was about fifteen weeks. A rapid convalescence ensued.

In the other cases, mentioned in this work, and amounting altogether to forty-six in number, in which emetics were employed, the only beneficial effect produced in any was a slight and transient amelioration of the cough and dyspnœa. In some, their exhibition was decidedly prejudicial, causing a marked increase of the respiratory embarrassment; and in not a few the patient seemed to have been in imminent danger of suffocation, from the foreign body being forcibly impelled against the larynx in the act of vomiting. In most of the cases the emetic was administered soon after the accident, but in some not until after the lapse of several days, and even weeks. The articles generally employed were ipecacuanha, tartrate of antimony and potash, and sulphate of zinc, either separately or variously combined. In several of the cases the vomiting was occasioned by olive oil, a febrifuge powder, an expectorant, or a dose of cathartic medicine. The emetics were repeated only in a few instances. In a case under my own observation, they had been given three successive mornings before the patient fell into my hands. The following tabular arrangement will exhibit this subject in a more interesting point of view.

TABLE SHOWING THE UNSUCCESSFUL EMPLOYMENT OF EMETICS.

FOREIGN BODY.	AGE.	AUTHORITY.
1. Bean.	8 years.	Dupuytren.
2. Bean.		Hoyt.
3. Jaw-bone of a mackerel.	2 years.	Pelletan.
4. Pipe-stem.	4 years.	Hall.
5. Button-mould.	10 years.	Atlee.
6. Bean.	9½ years.	Boyer.
7. Water-melon seed.	4 years.	Wells.

	FOREIGN BODY.	AGE.	AUTHORITY.
8.	Shingle-nail.	5 years.	Eve.
9.	Piece of apricot-kernel.	4 years.	Lescure.
10.	Pebble.	6 years.	Bullock.
11.	Bone.	22 years.	Struthers.
12.	Piece of nut.	2½ years.	Reiche.
13.	Damson-stone.	10 years.	Harbord.
14.	Grain of corn.	5 years.	McPheeters.
15.	Grain of corn.	6 years.	Maxwell.
16.	Water-melon seed.	6 years.	Maxwell.
17.	Bone.	30 years.	Arnot.
18.	Piece of cedar and silk thread.	7 years.	Author.
19.	Bullet.	5 years.	Maxwell.
20.	Cockle-bur.	12 years.	Dugas.
21.	Water-melon seed.	4 years.	Author.
22.	Peanut.	1 year.	Thompson.
23.	Claw of a lobster.	5 years.	Van Buren.
24.	Water-melon seed.	4 years.	Cartwright.
25.	Grain of corn.	9 years.	Author.
26.	Grain of corn.	3 years.	Guy W. Wright.
27.	Plum-stone.	9 years.	Bell.
28.	Bit of cocoanut.	5 months.	Bushe.
29.	Sixpence.	30 years.	O'Reilly.
30.	Water-melon seed.	4 years.	Jameson.
31.	Plum-stone.	6½ years.	Duchateau.
32.	Filbert.		Dominique de Sala.
33.	Grain of corn.	5 years.	Author.
34.	Pebble.	12 years.	Pelletan.
35.	Bean.	2½ years.	McCormack.
36.	Bean.	6 years.	Dupuytren.
37.	Glass bead.	5 years.	Boyer.
38.	Piece of sponge.	44 years.	Peaslee.
39.	Bell-button.	8 years.	Dickin.
40.	Prune-stone.	26 years.	Jobert.
41.	Piece of charcoal.	14 years.	Allen.
42.	Grain of coffee.	12 months.	Clark.
43.	Bean.	4 years.	McCown.
44.	Bean.	2 months.	Anonymous.
45.	Grain of coffee.	9 months.	J. L. Atlee.
46.	Hickory-nut shell.	9 years.	J. L. Atlee.

From an inspection of the above table, it will be seen that nearly three-fourths of the patients were under ten years of age, and that the offending substances were exceedingly diversified in their composition, size, and configuration. The most numerous articles were beans, water-melon seeds, and grains of corn. Twenty-five of the patients were males, and sixteen females, the sex in the rest not being specified.

Personally, I have no experience with this class of remedies in this accident, having never administered them in a single instance. A number of cases, besides those already mentioned, have been reported to me, in which their exhibition was signally unsuccessful; and I should therefore be disposed to discard them altogether as unworthy of the confidence of the practitioner. The only cases in which, in my opinion, they should be employed, are those in which there is great respiratory embarrassment, in consequence of the excessive accumulation of mucus in the air-cells and bronchial tubes, or in which the symptoms are of a marked asthmatic character. Under such circumstances, the exhibition of emetics could hardly fail to be beneficial, from their tendency to allay spasm and remove obstruction. But they should not be given even here unless the patient be carefully watched by the medical attendant, lest he be suffocated, during their action, by the impulsion of the offending body into the larynx. Should such an event be threatened, the windpipe should be opened without a moment's delay.

SECTION II.

STERNUTATORIES.

The offending substance, after having resisted the employment of various means for its expulsion, is sometimes ejected in a fit of sneezing, spontaneously induced. Such an event must, of course be exceedingly rare, and so far as I know there is but one instance of the kind on record. The case occurred in the practice of Dr. Bannister, of Phelps, New York, and is related in the thirty-sixth volume of the *Boston Medical and Surgical Journal.* The patient, a child, aged two years and a half, had drawn into her windpipe a piece of brass metal, which, at the end of six weeks, she ejected in an accidental paroxysm of sneezing.

I am not aware, as has been just stated, that an example of a kind similar to the above exists in the annals of surgery. The occurrence is interesting, but, from its infrequency, of little practical value.

Sternutatories of every description, mild and harsh, vegetable and mineral, have been repeatedly resorted to with a view of promoting

the expulsion of foreign bodies from the windpipe; but seldom, so far as my information extends, with any benefit. This class of remedies appears to have been employed for this purpose at a very early period of the profession. The favorite articles, for a long time, were euphorbia and white hellebore, reduced to the finest possible powder, and freely drawn into the nose. The use of even the smallest quantity of either of these substances generally produces the most severe and protracted sneezing, throwing the muscles of the chest into violent convulsive action, and causing an abundant flow of mucus from the air-passages. In one case, mentioned by Riedlinus,[1] success seems to have attended the use of snuff made of powdered lily-root. The patient was a child who had swallowed a small bone, which was ejected in a fit of sneezing induced by the inhalation of this substance.

Baron Boyer[2] met with an instance in which the employment of snuff appears to have aided in expelling the foreign body after the operation of laryngo-tracheotomy. After all attempts at extraction had failed, the wound was lightly covered with a piece of gauze, and the child put to bed. The respiration immediately improved, and two hours afterwards, while he was asleep, snuff was applied to his nose. The instant he awoke he began to cough and sneeze, followed presently by the ejection of the foreign substance—a kidney bean, of extraordinary size—which had been in the windpipe upwards of four days. The patient speedily recovered. In the case of a girl, aged six years and a half, upon whom Dr. A. R. P. Duchateau performed laryngo-tracheotomy, the substance, a plum-stone, was expelled under very similar circumstances. Dr. Thomas Wells and Dr. Charles Hall, on the contrary, each relate an instance in which errhines failed to do any good.

Ætius[3] advised that the use of sternutatories should be aided by bitter drinks, to induce vomiting, thus causing, as it were, simultaneously violent convulsive action of the respiratory muscles and a certain amount of relaxation of the general system; circumstances favorable to the expulsion of the extraneous body. Other ancient practitioners, with a similar view, recommended the exhibition of acrid substances, capable of exciting the fauces, and thereby pro-

[1] Bonetus Med. Sept. Scholion.

[2] Traité des Maladies Chirurgicales, t. v. p. 502. Paris, 1846.

[3] Chirurg. Franc., Deschamps, chapt. xxxii. Aunot.

voking cough. Fabricius Hildanus,[1] on the contrary, condemned this treatment, on the ground that the cough was already sufficiently severe, and that anything calculated to irritate the throat and windpipe would only tend to prevent the ejection of the extraneous substance. Instead of it, he was in favor of the prompt exhibition of almond oil and of soothing syrups, such as that of liquorice and marshmallow. He was also an advocate for exciting sneezing with irritating powders, as those of euphorbia and hellebore. Muys[2] and Verduc[3] also prescribed sternutatories and even emetics; the latter usually conjoining with them diaphoretics and volatile remedies, which he supposed to be useful in exciting the muscles of the larynx, so as to enable them to expel the extraneous body. He also suggested that the patient should swallow almond oil and fresh butter, to lubricate the air-passages, and thus favor the object in view. When these means failed, he advised a prompt resort to emetics.

The folly, if so mild a term may be used in reference to so serious a matter, of trusting to so frivolous a remedy as artificial sneezing, is forcibly exhibited in a case of foreign body mentioned by Muys, in his *Practical Surgery*, published in 1690.[4] A child, about seven years old, inhaled a bean, which caused the most violent cough, dyspnœa, and distress. Very soon the suffering subsided, and in a few days the little patient was able to resume his play. In stooping forward, however, he was attacked with the same symptoms as before; and after having experienced several relapses of this kind, he expired, in the third week after the accident. Muys, who, as Louis observes, had expressed himself in favor of bronchotomy in desperate quinsies, never once thought of opening the windpipe for the child's relief, but seemed to trust entirely to sneezing as the most effectual means of expelling the foreign substance.

It may be here stated that Louis, whose name has just been quoted, was decidedly averse to the use of errhines and emetics in this accident. In referring to Muys's case, he observes that this surgeon was not the only one who put confidence in such a frivolous remedy as artificial sneezing. "We need but reflect for a moment," he says, "on the mode of introduction of foreign bodies

[1] Cant. i. obs. 36.
[2] Obs. Chirurg. sec. vii. obs. 9.
[3] Pathol. Chirurg. t. ii. cap. 25.
[4] Pract. Chirurg. Ration. Decad. vii. obs. ix.

into the trachea, to see how little we can count on sneezing or vomiting in such a case."[1]

It is possible that this class of remedies might occasionally be beneficial, if conjoined with the use of chloroform. The proper plan would be to make the patient inhale this fluid until he is nearly or wholly insensible, and to irritate the Schneiderian membrane with snuff or some other substance the moment he begins to regain his consciousness. Should sneezing ensue while he is in this condition, with the air-tubes in a state of perfect relaxation, it is easy to conceive how the foreign body might be ejected. Nature would be taken, as it were, by surprise, as she has sometimes been by a dream, as in the remarkable case occurring in the practice of Mr. Cock, of London. As the use of sternutatories, exhibited in the ordinary manner, has hitherto been almost invariably unsuccessful, I merely throw out this hint for the consideration of the reader, without feeling inclined to place much confidence in it.

SECTION III.

INHALATION OF IODINE.

A very interesting case, in which a piece of fish-bone was expelled from the windpipe under the influence of the inhalation of iodine, occurred in 1832, in the practice of Mr. Day,[2] a surgeon at Isleworth, England. The following are the particulars of it. The plan of treatment was both novel and ingenious.

The patient, a lady, sixty years old, had been ill about four years at the time she first sent for Mr. Day. She had been treated by many of the most eminent professional men in London without benefit, and the only relief which she had obtained, during the last few months, was from a dose of opium at bedtime. She was, at the period here referred to, very weak and emaciated, and apparently in the last stage of phthisis; being in a state of great nervous irritability, and laboring under copious expectoration of mucus, slightly intermixed with pus. When requested to take solid food, she de-

[1] Second Memoir on Bronchotomy, *op. cit.* p. 263.

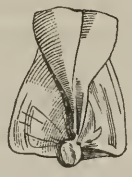
[2] London Med. Gazette, vol. ii. p. 765, 1833.

clared her inability to swallow it. As all the ordinary remedies had been employed in vain, Mr. Day determined to try the inhalation of iodine, according to the plan recommended by Sir Charles Scudamore in diseases of the mucous membrane. The first inhalation, which was rather strong, was continued for five minutes, and produced violent coughing and nausea. The operation was repeated the same evening, and in the paroxysm of coughing induced by it, the foreign body was ejected from the windpipe. It proved to be the vertebra of a fish, which she had swallowed on the 24th of February, 1828, and which had remained in the air-passages until the middle of April, 1832. The length of the bone was five-six-

Fig. 13.

Fig. 14.

Fig. 15.



teenths of an inch, and the width in proportion. The annexed figures, 13, 14, and 15, giving different views of it, are somewhat magnified for the sake of perspicuity.

The above case, so far as my information extends, is the only one in which this mode of treatment has yet been tried. Considering the prompt and happy effects which it exerted in that instance, it is surprising that it has not attracted more attention. It should certainly not be relied upon, perhaps not even employed, in recent cases; but I can perceive no objection why the remedy might not be tried in the chronic form of the accident.

SECTION IV.

ANTIPHLOGISTIC MEANS.

It is well known that no patient is safe as long as the foreign body remains in the windpipe. If he do not perish from suffocation, as he may at any moment in a paroxysm of coughing, forcing the substance into the larynx, he will be in danger of losing his life eventually by inflammation. The period at which this action

supervenes after the accident is too variable to admit of any definite statement; it may take place in a few hours, or it may be postponed for several days or even weeks. In one case it may be slight, perhaps scarcely appreciable; while in another it may be so severe as to cause the most serious structural lesion, and even death, and that, too, before the patient and his physician are aware of the true nature of the case. It is for this reason that every patient, thus affected, should be most sedulously watched from the moment of the accident until the final riddance of the foreign substance, and of the mischief produced by its presence. The neglect of this precaution has caused the loss of many lives that might otherwise have been saved. A want of care here even for a few hours may be followed by the most mischievous consequences, which no remedies, however skilfully or energetically employed, may afterwards be able to arrest. The old maxim, "an ounce of prevention is worth a pound of cure," is eminently applicable to all cases where the foreign body is permitted to remain in the windpipe, either from the unwillingness of the patient to submit to an operation, or from the inability of the professional attendant to perform it. The very moment the substance has entered the tube it becomes a source of mischief, fretting and irritating not only the parts with which it is in contact, but even, in many instances, those at a distance, and thus gradually but steadily undermining the very foundations of life. The practitioner who, under such circumstances, contents himself with the use of a little expectorant medicine, and the occasional exhibition of an emetic, has no just appreciation of his duty, and is unworthy of his position.

Every individual who has a foreign body in his windpipe should be regarded as an invalid, unfit to leave his room, or to attend to business. The treatment, in the early stage of the complaint, should be limited to a general supervision of the patient's health; that is, his diet should be carefully regulated, the bowels should be moved from time to time with mild purgatives, and the utmost attention should be paid to the temperature of the apartment, which should be uniformly maintained at about 65° of Fahrenheit's thermometer. The chest should be thoroughly examined at least twice a day by auscultation and percussion, to ascertain the condition of the lungs and bronchial tubes. Cough should be subdued by mild expectorants, containing, if there be frequent spasm, a suitable quantity of opium, morphia, or laudanum. Should symptoms of

pneumonia, bronchitis, or pleuro-pneumonia supervene, they must be promptly met by the ordinary remedies, particularly the lancet, active purgatives, and tartar-emetic, aided, if necessary, by leeches and blisters. In short, nothing is to be omitted that is calculated to save the part and system from irreparable injury. By watching the patient in this way, the respiratory organs may be protected from mischief, and the extraneous substance be expelled spontaneously; or, should an operation become necessary, he will be in a much better condition to undergo it with impunity.

The cough produced by the presence of the extraneous substance is sometimes promptly allayed by a sup of cold water, or, in fact, by a draught of almost any fluid. The relief is, of course, only temporary, but the circumstance is not, therefore, the less worthy of remembrance. The probability is that the effect occurs very frequently, but the only recorded instance of the kind, so far as my reading extends, is that mentioned by Dr. Houston,[1] of Dublin. The patient was a girl, aged sixteen years, who in a fit of laughter allowed a piece of wood which she held in her mouth to slip into the windpipe. Her fits of coughing, which were frequent and severe, especially at night, were always promptly relieved by a sup of any liquid.

Dr. Laserrie Pagen[2] mentions an instance in which similar effects always followed the administration of a teaspoonful of olive oil. The relief is said to have been as if by enchantment. The good effects of the remedy were displayed as often as the paroxysms recurred, until finally, at the expiration of forty days, the foreign substance, a bean, was expelled in fragments by the sole efforts of the child.

But, although the foreign body may have been thus happily gotten rid of, yet the patient is by no means always safe. The air-passages, irritated by its presence, may have taken on inflammation before its expulsion, or this action may be set up soon after; and in either case the danger to life may be very great. A knowledge of this fact is of great practical importance, and cannot be too strongly enforced upon the mind of the professional attendant in all cases of this character. From inattention to this subject there is reason to believe that much harm has occurred that might otherwise have

[1] Dublin Journal of Medicine, vol. xxv. p. 532, 1844.

[2] Archives Générales de Médecine, 2d series, t. vii. p. 369, 1840.

been easily prevented. The following case, which fell under my observation more than twenty years ago, illustrates, in a very striking manner, the truth of this remark.

A little girl, aged five years and a half, the daughter of an Irishman, one evening just before dark drew into her windpipe one of several small round beans which she happened, at the moment, to have in her mouth. Violent coughing, difficulty of breathing, and partial insensibility were the immediate result of the accident. Recovering in about three-quarters of an hour from her suffering, she passed the night in tolerable comfort, but in the morning the fit of coughing and dyspnœa returned, and thus the case continued for nearly three days. At the end of this period she was suddenly seized with a violent paroxysm of coughing, apparently threatening instant suffocation, but happily followed, in a few minutes, by the expulsion of the offending substance. The breathing being thus relieved, the child in a short time became as lively and merry as a cricket. The parents, supposing all danger to be over, neglected my injunctions to watch her, and to regulate her diet and bowels; in fact, she was permitted to have her own way in everything. On the morrow she began to droop a little; there was some cough and fever, and she complained of pain and soreness in the right side of the chest. The symptoms gradually increased, and when I saw her again, three days after the commencement of her illness, she was laboring under violent pneumonia, which, despite all I could do for her, went on to a fatal termination.

The above instance is not a solitary one; the records of surgery are crowded with them. Had the child been carefully watched, she would not have perished from an accident, from the effects of which, under proper management, hundreds have recovered. But a spark had been kindled in her lungs, which a drop of water might have extinguished in its incipiency, but which, having once spread, nothing could afterwards subdue.

CHAPTER VIII.

INVERSION OF THE BODY.

Another expedient occasionally resorted to, especially of late years, for promoting the expulsion of the foreign substance, is inversion of the body. The operation, as the name implies, consists in suspending the patient by the heels, or in securing his body, with the head inclined downwards, to a chair, narrow table, or other suitable object. While in this position, the chest and back are repeatedly and smartly struck with the hands, to aid, first, in dislodging the offending substance, and, next, in propelling it through the glottis; or, in case of bronchotomy, through the artificial opening in the neck. With the same view, the thorax is sometimes suddenly and forcibly compressed, the patient having previously taken a full inspiration. The object of this manœuvre is to empty the lungs, as rapidly and as completely as possible, of air, in order that, as it rushes through the windpipe, it may carry the intruder before it. The compression is usually effected with the hands, applied at opposite points of the trunk; but, perhaps, a better method is to make it with a broad bandage, arranged so as to encircle the chest, and slit at the ends, after the fashion of the bandage used in tapping the abdomen. The patient having taken a full inspiration, the extremities of the bandage are suddenly drawn in opposite directions, thereby compressing the thoracic walls equably and forcibly at every point.

1. *History.*—Inversion of the body, with or without succussion, compression, and percussion of the chest, has probably been practised from time immemorial. The first account of it, however, which I have been able to find, is contained in the third volume of *Birch's History of the Royal Society of London.* The case referred to was that of an individual, who, having inhaled a plum-stone, was suspended by the feet, when the foreign substance was almost im-

mediately expelled. A similar instance is mentioned by Deschamps.[1] In this country, the experiment appears to have been first tried by Dr. John Newman, of Salisbury, North Carolina. This gentleman resorted to it soon after the commencement of the present century, in the case of a child, aged four years, who, while at play, let a bullet pass into the windpipe.

When this mode of treatment was employed by others I have not the means of judging; but Dr. Newman's case, no doubt, soon attracted the attention of professional men, and induced them to try the expedient upon their patients. Be this as it may, it is certain that it has met with considerable countenance of late years, and that it has been frequently employed by some of the most distinguished practitioners both in America and Europe.

2. *Objections.*—The great objection to the operation is the risk which the patient incurs from suffocation, occasioned by spasm of the glottis from the contact of the extraneous body in its attempt to pass through the larynx. In the case which occurred in the practice of Dr. Newman, the distress induced by it was so sudden and alarming that, had it not been instantly desisted from, the child would probably have perished from its effects. This result will, I think, generally follow the operation, and the only way of preventing it is to make a preliminary opening into the trachea. By this procedure, all danger of producing spasm of the glottis will be removed, and the foreign body will have a chance of escaping either through the larynx, or at the wound in the neck. Without this precaution, inversion of the body, unless practised with the greatest possible care, may be attended with very serious, if, indeed, not fatal consequences. What effect chloroform might exert in lessening the danger consequent upon the operation, without previously opening the windpipe, cannot be stated with any degree of certainty; for, so far as I know, no one has given the treatment a trial, and, until this be done, it would be idle to indulge in any speculation concerning it. The expedient thus modified is, I think, worthy of consideration, and I shall certainly employ it the first opportunity that may present itself.

3. *Successful cases.*—The following cases are appended in illustration of this mode of practice. It will be noticed that the extra-

[1] Journal de Médecine Continué, t. ii. p. 555.

neous body, in two, was a bullet, a shot in one, a corn in another, and in the fifth a water-melon seed.

Case 1.—*Leaden bullet; boy, four years old; tracheotomy on the eighth day; inversion of the body, and the passage of the foreign substance into the stomach; recovery.* (John Newman, M. D. Medical Repository, vol. iv. p. 250, second hexade. New York, 1807.)

A child, aged four years, while at play with his companions, allowed a leaden bullet which he happened to hold in his mouth to pass into the windpipe. Strong symptoms of suffocation instantly took place, and continued by paroxysms, with a few hours remission, until the seventh day. At the end of this period, and after every expedient had been tried unsuccessfully to expel the foreign substance, the father of the child sent for Dr. Newman. The child was now laboring under great dyspnœa, attended with a croaking, gulping sound; the eyes had a distorted appearance; and the countenance was of a dark purple color. Next day, the eighth after the accident, the little patient was suspended by the feet and legs, and his head and shoulders inverted, when the body was agitated, and repeated strokes were applied to the back with the hand. In a few minutes the bullet was dislodged, passing with considerable force, and with a noise like that of a popgun, against the larynx. The face of the child immediately became purple, the respiration laborious and very difficult, and the other symptoms of strangulation so alarming as to excite apprehensions of speedy dissolution. Without any loss of time, an incision, reaching nearly to the top of the sternum, and embracing four or five of the rings of the trachea, was made into the windpipe. A probe, curved at the end, was introduced into the tube, with a view of searching for the bullet; but as this excited cough and pain, the instrument was immediately withdrawn. The body was now again inverted, as before the operation, and while in this situation the probe was carried upwards towards the throat, where its extremity could be clearly seen. All operative proceedings were now stopped, and the child, being placed upon the lap of an assistant, soon began to breathe with much greater ease. The wound being kept open, gave vent to fetid air and purulent mucus at every effort at coughing, which recurred at short intervals, but in other respects the symptoms were very flattering.

Believing that the bullet had passed into the stomach, Dr. New-

man ordered a dose of calomel and jalap, and in a few hours he had the satisfaction to see it discharged with the first stool. The wound was now closed by stitches and adhesive plaster, and in a short time the little patient was restored to perfect health, without the slightest injury to his voice. It should be added that the bullet had a very rough surface, having been considerably indented by the teeth.

Case 2.—*Shot; young lady; retention for several weeks, and ejection in a violent fit of coughing during inversion of the body; repeated attacks of hæmoptysis afterwards, and ultimately death from phthisis.* (Dr. Richard Hopkins, Med. and Philos. Lyceum, vol. i. p. 42. Baltimore, 1811.)

A young lady, espying a middle-sized shot upon the floor, put it into her mouth, and was gently chewing it, when, in a sudden fit of laughter, she allowed it to pass into the trachea. Violent coughing immediately succeeded the accident, and harassed her almost incessantly. Four physicians were called in, and, during several weeks, made use of a variety of remedies, such as repeated bleedings, and oleaginous, demulcent, and anodyne medicines, which, although they somewhat appeased the cough, failed to afford permanent relief. In this condition the patient was abandoned by her professional attendants, under the impression that their services could be of no further benefit. The mother, an unusually intelligent woman, now determined to watch her with redoubled vigilance, and to contrive some plan by which she might promote the expulsion of the foreign substance. Having carefully inspected the larynx and trachea of a hog, it occurred to her that the shot might find its way out by the glottis by inverting the body. This conclusion derived support from the fact that the shot had often been felt high up in the throat, during violent fits of coughing. Having duly reflected upon the subject, she resolved to put her theory to the test of practice, without having imparted the scheme to her daughter. Waiting for a violent attack of coughing, she threw her forcibly out of the bed upon her hands, and had the satisfaction to hear the shot immediately roll out upon the floor. The young lady gradually recovered, and enjoyed tolerably good health for many years; she married, and had several children, but was subject to frequent attacks of hæmoptysis, and ultimately died of phthisis. Whether the sojourn of the shot, which had been rendered some-

what rough by the previous chewing, laid the foundation of this untoward occurrence, it would be impossible to determine.

"Although the result of the above case," says Dr. Hopkins, "does not redound much to the honor of the scientific gentlemen who attended it, some useful lessons may be drawn from it, and therefore it becomes necessary to record it. It may, perhaps, tend to rouse physicians to a more vigorous exertion, and excite them to indefatigable industry in inventing ingenious modes of cure, whereby they may supersede the necessity of quacks and ignorant pretenders, stepping in during our moments of listlessness and inattention; for by our aversion to mental exertion we often give them occasion to triumph over us to our shame and confusion. For these reasons, it behooves us in this our enlightened day, by assiduity and attention, to exhaust invention itself, for the utmost attainment of all the art is capable of, that we may retain our excellent art among ourselves."

Case 3.—*Bullet; man, aged twenty years; violent cough, followed in two hours by comparative ease; afterwards, by fixed pain in the chest, dyspnœa, and great drowsiness; inversion of the body, and shaking of the chest; expulsion on the third day after the accident; recovery.* (Mr. Liston, Practical Surgery, p. 421, fourth edition, London, 1846.)

A shepherd, about twenty years of age, while mumbling a small leaden bullet between his teeth, allowed it to slip into his windpipe. The accident was immediately followed by a fit of violent coughing, which continued without interruption for two hours, after which he suffered comparatively little inconvenience until the middle of the next day, when he had rigors, headache, and a deep-seated pain in the right side of the chest, referred to a point as low as the sixth rib, half-way between the sternum and the spine. The respiration became also much embarrassed, and the pulse was scarcely distinguishable at the wrist. Mr. Macrae, in whose hands this case occurred, did not make any opening into the windpipe, but on the third day after the accident he had the patient strapped securely to a common chair, that he might be easily suspended from the rafters of the roof, with his head downwards, in order that his chest might be conveniently shaken by a rapid succession of sudden smart jerks, and that the weight of the bullet might favor its own escape from its seat in the lungs. He was kept depending as long as he could endure such an uncomfortable situation, and then placed

in the horizontal posture for a few minutes to rest. When sufficiently recruited, he was hung up again. Upon being taken down the first time, he described the pain in the breast as having moved nearer to the top of his chest; and during the third suspension, he joyfully exclaimed: "Thaniga! thaniga!" implying, in the Gaelic language, "it has come! it has come!" immediately after a smart shaking and a few convulsive retching coughs, and spat the little bullet from his mouth. Its diameter was three-eighths of an inch, and its surface was ruffled by the chewing which it had undergone previously to its escape into the windpipe. The man experienced immediate relief from every uneasy feeling, except a dry cough and a deep-seated pain in his breast, which continued rather sharp for two days, after which, and a dose of laxative medicine, he found himself restored to his former health; and by the end of the week pursued his usual avocation on the hills.

Case 4.—*English shilling; man, violent cough and dyspnœa; probable lodgement of the coin in the lower part of the larynx; partial aphonia; inversion and shaking of the body, followed by the ejection of the foreign substance; recovery.* (Dr. Duncan, Northern Journal of Medicine for 1845; London Med. Gazette, vol. i. p. 218; 1845.)

A man, while amusing himself in tossing up a shilling and catching it in his mouth, felt it descend into the larynx. A violent paroxysm of coughing, attended with great difficulty of breathing, was the immediate result of the accident. The dyspnœa continued for some minutes, and then gradually passed off, leaving the patient sufficiently comfortable to walk some distance for medical advice. A physician, who saw him half an hour after, found the breathing but little embarrassed, except when he changed his posture, or made a forcible inspiration, when he became immediately worse. He was in this condition an hour after the occurrence of the accident, when he was examined by Dr. Duncan. The voice was now reduced to a whisper, and the man felt as if there were a valvular body in the windpipe, impeding the passage of the air. No unusual sound was discovered by auscultation. When the larynx was compressed, the patient stated that he was perfectly satisfied that the coin was lodged in the lower part of that cavity, opposite the cricoid cartilage. He had an impression that it could be ejected were he to stand upon his head, and the suggestion, meeting with the approval of Dr. Duncan, was accordingly carried

into execution. The man being placed with his shoulders against the raised end of a pretty high sofa, his body was suddenly turned upside down by three powerful persons seizing him by the loins and thighs. The head being thus rendered the most dependent portion, at the same time that the body was forcibly shaken, and the larynx moved rapidly from side to side, the shilling passed into the mouth, and fell upon the floor. Not the slightest cough or dyspnœa was produced; all uneasiness immediately disappeared; the voice at once improved, and there was not a single bad symptom afterwards.

The following case, which falls under this head, is mentioned by Dr. Buck,[1] of Wilmington, Massachusetts. A boy, about two years old, was suddenly seized with symptoms of a severe pulmonic affection, which continued above three months, and was attended by occasional but severe suffocative paroxysms, greatly reducing his strength, and endangering his life. At the end of this period, in a violent attack of this kind, his mother was induced to give him a smart blow on the back, which had the effect of driving the foreign body, a water-melon seed, from the trachea, followed by complete recovery.

4. *Inversion of the body, and striking the back with a pillow.*—This method of expelling foreign bodies from the windpipe was suggested, a few years ago, by Dr. Charles Hansford,[2] of Knoxville, Illinois. Its essential features consist in inverting the body, as usually practised, in filling the chest completely with air, and then, while the patient is making a forcible expiration, striking the back with a hard pillow. The first case in which Dr. Hansford had an opportunity of testing this mode of treatment was that of a negro child, who had accidentally inhaled a pin, and who was laboring at the time under all the distressing effects consequent upon the presence of a foreign body in the air-passages. The patient was directed to lie upon a bench, with her face downwards, and projecting over its edge. In this situation she was requested to take a full inspiration, so as to fill the lungs completely with air, when the back was smartly struck several times with a pillow, made hard and firm by compression. The effect was the immediate expulsion of the pin

[1] New England Journal of Medicine and Surgery, vol. ii. p. 281. Boston, 1813.

[2] North-Western Med. and Surg. Journ. for May, 1849; Amer. Journ. Med. Sciences, N. S., vol. xviii. p. 294.

from the larynx; "the first blow moving it about an inch, and the second forcing it into the mouth."

Since meeting with the above case, Dr. Hansford has had, it would seem, several other opportunities of witnessing the happy effects of this method of treatment. "I have driven out," says he, "water-melon seeds in this manner on three different occasions, a grain of corn at one time, and a large glass bead at another."

I know nothing of this method of treatment from personal observation, but am disposed to regard it favorably, from the fact that the force applied to the back is much more powerful than when made with the hands, or in the ordinary manner. I should think it particularly worthy of trial in inversion of the body after the operation of bronchotomy.

5. *Prone position of the body, combined with extension and retraction of the head.*—Dr. John L. Atlee, of Lancaster, Pennsylvania, in an interesting and valuable communication on foreign bodies in the air-passages recently sent me, suggests that expulsion might occasionally be effected by placing the patient in a position similar to that for bronchotomy, the head being bent over a cylindrical block, so as to render the neck as prominent as possible anteriorly. While in this position, he should, if old enough, be required to cough violently and frequently, in order to dislodge the extraneous substance, and thus afford it a chance of escaping by the natural outlet. If, on the contrary, the patient is a child, the respiratory organs should be excited by sternutatories, and, while he is in this condition, the head should be held up and retracted, to the necessary extent, by assistants. These trials might be frequently repeated, and an operation delayed as long as there is no urgent necessity for its performance. Dr. Atlee has not had, it would seem, an opportunity of ascertaining, anatomically, whether this position is best calculated to favor the passage of foreign bodies upwards through the glottis, but such, he thinks, is the fact, from what he witnessed in one of his cases. The suggestion, I believe, is novel, as I have not met with it in any of my bibliographical researches. Its value can be determined only by experiment.

6. *Inflation of the lungs, and forcible compression of the walls of the chest.*—Some years ago, an anonymous writer in the *London Lancet* proposed the following method as a means of promoting the expulsion of foreign bodies from the air-passages, without, however, informing the profession whether he had ever put it in practice. The

patient being placed in the prone position, the abdomen is to be well compressed as a kind of preliminary measure. He then takes a very deep inspiration, in order to distend the lungs as thoroughly as possible, when the operator applies one hand to the back, and with the other forcibly presses the chest, or even gives it a smart blow. This process should, if necessary, be repeated several times, either in rapid succession, or at different intervals. In the event of failure, the position of the patient is to be changed, and the chest struck as before.[1]

7. *Inversion of the body, along with bronchotomy.*—It has been already stated that inversion of the body, without previously opening the windpipe, may, unless most cautiously practised, be attended with very serious, if not fatal consequences. In the interesting case of Mr. Brunel, recorded by Sir B. C. Brodie,[2] it invariably produced the most distressing coughing, with symptoms of impending suffocation, compelling the experimenter at once to desist. The object was, by permitting the patient's head and shoulders to hang over a chair, while the body was in the prone position, to afford the extraneous substance, a half-sovereign, an opportunity of slipping through the rima of the glottis into the mouth. During every effort of this kind, there was a distinct perception of a loose body passing forward along the trachea, and striking against the larynx. Tracheotomy was afterwards performed, and an attempt made, but in vain, to extract the coin with the forceps. Finally, at the expiration of the sixteenth day after the operation, the patient's body and shoulders were secured to a peculiar contrivance, a sort of platform, made movable on a hinge in the centre, and so arranged as to permit the head to be brought to an angle of about 80 degrees with the horizon. The back being now struck with the hand, severe coughing ensued, followed almost immediately by the ejection of the offending substance. Several other instances, in which severe and threatening symptoms attended inversion of the body, without previous opening of the windpipe, are described in different parts of the present treatise.

8. *Unsuccessful cases.*—Cases in which this experiment was employed unsuccessfully, are mentioned by Dr. J. Mason Warren, Professor Eve, Dr. Hoyt, Mr. Luke, Mr. Bransby B. Cooper,

[1] Boston Med. and Surgical Journal, vol. xxiv. p. 18.

[2] Medico-Chirurg. Transactions of London, vol. xxvi. p. 286.

Dr. O'Reilly, and others. I subjoin the following abstract of these cases.

Dr. Warren's[1] patient was a little girl, eight years of age, who, in the act of laughing, had inhaled, only a short time previously, a common garden bean. The child was taken by the legs, and held with the head downwards; the chest was then percussed, and a finger passed deeply into the throat, to provoke vomiting. This process was twice repeated without success. A large quantity of mucus was ejected by coughing, but no strangulation ensued, denotive of a change in the position of the foreign body. Tracheotomy was performed two days after, and the bean extracted with the forceps. In the case of Professor Eve,[2] the patient, a boy, aged five years, was suspended by the heels, and repeatedly struck on the back and chest, the offending substance being a shingle nail, which was subsequently removed by operation. In Dr. Hoyt's[3] case, the inversion was tried immediately after the accident. Subsequently, the patient was secured to a frame, after the manner of Mr. Brunel; after the process had been several times repeated, it was obliged to be discontinued, as the bean in its passage upwards towards the larnyx very nearly suffocated the boy. Mr. Luke, of London,[4] saw a boy, nine years old, on whom inversion had been tried, on account of the inhalation of a pebble, but without success. In the case of Mr. Bransby B. Cooper,[5] the operation was repeated three times soon after the accident, and always produced violent coughing and dyspnœa; it was followed by ecchymosis of the conjunctivæ, and the boy declared that he could feel the pebble move up and down the windpipe during the whole period of the ordeal. In Dr. O'Reilly's[6] case, a man, aged thirty, had his body several times inverted unsuccessfully, on account of a sixpence in the left ventricle of the larynx. A man, treated by Mr. Solly,[7] of London, had been made, by another surgeon, to stand on his head, on account of a pebble inhaled a short time before.

[1] Boston Medical and Surg. Journ. vol. xxxvii. p. 390.
[2] Nashville Journ. Med and Surgery, vol. v. p. 129.
[3] American Journ. Med. Sciences, N. S. vol. xxv. p. 267, 1853.
[4] London Med. Gazette, vol. xxii. p. 296.
[5] London Med. Gazette, N. S. vol. v. p. 303, 1847.
[6] New York Med. Gazette, vol. iii. p. 224, 1852.
[7] London Lancet, vol. i. p. 480, May 5, 1849.

CHAPTER IX.

SURGICAL TREATMENT.

ARTICLE I.

GENERAL OBSERVATIONS.

A CAREFUL examination of the facts which are comprised in this treatise, will, I think, serve to satisfy any one, however prejudiced or skeptical, that the only real safety of a person, laboring under a foreign body in the air-passages, consists in bronchotomy. We have seen, it is true, that various substances, entrapped in these passages, may be ejected, either spontaneously, or through the intervention of art, as the use of emetics and sternutatories, or even by simple inversion and succussion of the body; but no one, surely, acquainted with the subject would adduce such cases for the purpose of establishing a rule of practice. They are the exceptions, not the rule, and, as such, they are valuable and worthy of consideration. As long as the extraneous substance remains in the windpipe, the patient, as has been already repeatedly stated, is in constant danger of being suffocated; or, if he escape so horrible a death, of perishing from inflammation and its consequences. The proper practice, therefore, is, in all cases without exception, to perform bronchotomy as soon as possible after the occurrence of the accident. The artificial aperture effectually prevents spasm of the muscles of the larynx, and thus enables the patient to breathe with greater freedom, at the same time that it permits the foreign body, if it do not escape at once, to play up and down the air-tubes with comparative impunity. In many cases, however, the foreign substance is expelled as soon as the windpipe has been properly opened, being often projected to a considerable distance from the patient's body. In general, it escapes at the artificial orifice, but sometimes

it passes through the glottis, and is either expelled by the mouth, or it descends into the stomach. The ejection is occasionally delayed for days, weeks, and even months after the operation, and even after the closure of the wound. Under such circumstances, a second, and even a third operation may become necessary, as in several of the cases mentioned in this treatise.

The unfortunate effects of postponing operative interference in this accident, are forcibly displayed in numerous cases recorded in our surgical and periodical literature. Examples, indeed, occur in almost every community, and it is much to be regretted that they are not more frequently published for our benefit. A volume of such cases would form a most valuable and instructive legacy to our profession. A few instances of this kind may be appropriately subjoined here, inasmuch as they will tend to impress the subject more fully upon the attention of the reader.

The first case that I shall mention occurred a few years ago, in the practice of my friend, Dr. H. W. McCown, of Bardstown, Kentucky, and was very kindly communicated to me by that gentleman.

A very fat, healthy girl, four years of age, had the misfortune, while at play, to swallow one of several small kidney beans which she happened, at the moment, to have in her mouth. The accident was followed by a very distressing spasmodic cough, attended with a sensation of choking. Called soon after its occurrence, Dr. McCown administered an emetic, which acted freely and promptly, but failed to cause the ejection of the foreign body. The symptoms continued, without any material change, during the remainder of the day, and were followed by some fever during the night, in consequence of which a dose of calomel was given, with the effect of thoroughly evacuating the bowels. The respiration continued to be very laborious; and about fifty-five hours after the accident the child was seized, while the medical attendants were examining her with a view to the performance of an operation, with a violent spasmodic cough, in which she suddenly expired. The bean, softened and much enlarged, was found, on dissection, in one of the bronchial tubes, the mucous membrane of which was highly inflamed.

In a case which occurred in the practice of Dr. Allen, of Rockville, Indiana, and the particulars of which were communicated to me by Dr. James D. Maxwell, of Bloomington, in that State, the child died under similar circumstances. Dr. Allen was requested to visit the patient, four miles in the country, without being apprised

of the nature of the illness, and before he had time to obtain his instruments the child expired.

In another case, mentioned to me by the same gentleman, no operation was performed, and the child died in about forty-eight hours. The foreign body was part of the bur of a beech-nut. The case occurred in Monroe County, Indiana, in the practice of Dr. Hammil, formerly of Bloomington.

A child, four years old, eating greedily, swallowed a large piece of bone, which passed into the windpipe, and produced instantly all the ordinary symptoms of such an accident. A surgeon being called, found, upon his arrival, all the symptoms abated, and the child asleep. He made no examination. In the evening, the patient awoke with startings, and all the signs of suffocation returned; but in a little time they again ceased, and were afterwards renewed only at intervals. Some expectorant medicine being prescribed, the whole of the next day was passed in tranquillity; but in the night the symptoms returned, and the child, now more dead than alive, was brought to Desault.[1] The extremities were cold, and the laborious motions of the thorax afforded but a faint presage of success. Desault was, nevertheless, induced to attempt the operation, the more so as it was earnestly urged by the child's father. A momentary alteration for the better was the result; the little patient revived; but at the end of an hour all the symptoms returned, and death occurred the same evening.

A similar instance is related by Bonetus.[2] In 1650, the son of a goldsmith at Geneva, aged six years, in eating soup, allowed a little piece of bone to slip into the windpipe. The breathing was difficult, especially inspiration, which was very laborious, and attended by a pricking pain. The patient had a cough, and he pointed to the middle of the neck as the seat of the offending body. Bonetus advised bronchotomy, but was overruled by another practitioner, and the child died at the end of five days. The trachea being opened, the bit of bone was found and easily withdrawn.

The following case is given by Marcellus Donatus.[3] A lad, the son of a Jew, having inhaled a piece of chestnut, immediately experienced a sense of obstruction in the glottis. Being struck on

[1] Surgical works, by Bichat, translated by Smith, vol. i. 227. Phila. 1814.

[2] Sepulchret. Anatom. lib. ii. De affect. Pectores, sect. i. obs. 1.

[3] Hist. Medic. lib. iii. cap. viii. as quoted by Louis.

the back, by one of the bystanders, the breathing became less laborious, though it remained difficult until the beginning of the fifth day, when he died in an apothecary's shop, whither he had been carried for advice. The symptom which immediately preceded the death of the child was a slight cough, in the course of which he became livid, as if he had been choked with a cord.

But these unfortunate effects do not always occur so soon after the accident. Occasionally, they take place at a remote period; and the calm which succeeds the first symptoms may be so delusive as to throw the patient off his guard, and thus endanger his life. An instance related by Dr. Horatio G. Jameson,[1] of Baltimore, strikingly attests the truth of this remark. A youth, aged thirteen years, received a bean into his windpipe. Violent suffering ensued, but he became afterwards so much relieved that he considered the confinement enjoined by his attendant unnecessary. He obtained his mother's consent to leave the room; in the act of putting on his coat he was seized with severe coughing, and in a few minutes he expired in her arms. "What a lesson," as Dr. Jameson justly observes, "is here! Why was this young man allowed thus to perish, after the many successful operations which have been published, together with the correct views of Louis?"

The following cases admirably illustrate the happy effects of early and prompt operative interference. The first occurred in the practice of the late Mr. Liston,[2] the other in my own.

A boy, aged five years, was brought to the London Hospital, having half an hour previously, while laughing, drawn a small glass seal which he had in his mouth into the windpipe. Spasmodic cough and great dyspnœa, threatening suffocation, were the immediate consequences of the accident. On applying the stethoscope to the windpipe, the noise of a foreign body could be distinctly heard, as it moved up and down the tube or struck against the glottis at each forced expiration. Tracheotomy was immediately performed by Mr. Liston. For an instant the little patient seemed to be on the point of suffocation, as the first inspiration drew in a certain quantity of blood on cutting into the tube; but the next moment, the child being suddenly turned upon his face, the respiration was measurably relieved, and the glass seal, which was about

[1] Amer. Med. Recorder, vol. vi. p. 154. Phila. 1823.

[2] London Lancet, vol. ii. p. 250, 1844.

the size of the little finger-nail, was forcibly expelled. The breathing, as if by magic, became quiet, and the venous hemorrhage ceased.

A boy, aged four years, the son of Mr. Dorsey, in the neighborhood of Louisville, was sent to me by Dr. Kerrick, in May, 1850, on account of a grain of corn which he had drawn into the windpipe, about seven hours previously, while at play with some other children. The accident was followed by the ordinary symptoms; but, although violent, they soon passed off, leaving the child comparatively comfortable, with only an occasional paroxysm of coughing and some degree of dyspnœa. Auscultation afforded no evidence whatever as to the precise situation of the extraneous body. The respiration, in fact, appeared to be perfectly uniform in both lungs, and percussion elicited no abnormal sounds. The trachea having, with the assistance of Dr. D. D. Thomson, been freely divided, I waited for a few minutes in the hope of seeing the substance ejected; but finding that there was no prospect of this, I introduced a pair of slender forceps into the tube, using them as a probe. As nothing, however, was felt, the instrument was withdrawn, when in a few seconds, in a violent effort at coughing, the grain of corn, represented in the annexed sketch (Fig. 16), was forcibly ejected through the artificial aperture. The child recovered without an untoward symptom, and is still living.

Fig. 16.

An important question here presents itself: At what period after the occurrence of an accident of this kind should an operation be considered as improper? Or, more correctly speaking, what are the circumstances which contra-indicate a resort to the knife? It must be obvious that the mere lapse of time should not be taken into the account in the decision of such a question; for it is well known that one individual may experience as much damage from the presence of a foreign body in a week as another may in a month, or even a year. Thus, to particularize, the lungs may become seriously diseased and even partially disorganized in a few days in one case, while in another they may suffer little, if indeed at all, during any stage of the accident. Hence it should be a rule with the practitioner, in every instance of this kind, to institute, as a preliminary step, a careful and thorough examination of the chest, with a view of ascertaining the precise condition of the respiratory apparatus. If this be found to be healthy, or even

comparatively healthy, an operation, all other things being equal, would not only be justifiable but highly proper, whatever length of time might have elapsed since the inhalation of the extraneous substance; if, on the other hand, it be seriously diseased, the knife should be studiously withheld, certainly temporarily, if not altogether, on the ground that the artificial opening would be very likely to complicate the morbid action, and thereby enhance the danger both of the part and of the system. I should certainly not consider it proper to operate upon an individual who, in consequence of having inhaled a foreign body, was laboring under violent pneumonia, a large abscess, or extensive tubercular deposits. To employ the knife, under such circumstances, could hardly fail to injure the patient and to throw discredit upon surgery. I know, from personal observation, how difficult it is, in some of these cases, for a surgeon to pursue a proper course, to steer safely, as it were, between Scylla and Charybdis, and thus to satisfy the requirements of science and the wishes of the patient and his friends. A more trying situation can scarcely be imagined, certainly none which demands more judgment and decision of character. The following case, which occurred in my own practice, was one of this description.

A gentleman, of the name of Dougherty, whose case will be narrated at length in its proper place, in November, 1840, inadvertently inhaled a cockle-bur, from which he experienced the ordinary symptoms. About four months afterwards, I found him affected with hectic fever, accompanied with great emaciation, and copious purulent expectoration. On exploring the chest, the ear readily detected the existence of a large cavern in the right lung, along with other evidences of serious disease, and I accordingly declined to operate, although the patient was very anxious that I should open the trachea, his wishes being shared by his family and friends, and even by some of his medical advisers. His condition afterwards temporarily improved, and he lingered on, sometimes worse, sometimes better, until the following December, when he died completely worn out by hectic irritation. The body was examined by the attending physician, Dr. O'Brien, of Bedford, Kentucky, with whom I saw the case in consultation. The right lung, as I had diagnosticated at my visit in April, contained a large cavity, communicating with the right bronchial tube, in the lower extremity of which the bur, incrusted with mucus and lymph, was

firmly impacted. The tissues around the cavity were extensively hepatized, and the lung itself was universally adherent to the wall of the chest and the diaphragm.

The above case was one in which, in my judgment, an operation was clearly contra-indicated. Had the windpipe been opened at the time of my visit, in the exhausted and diseased condition of the patient,-the probability is that it would have terminated fatally much sooner than it did. There is no reason to believe that the foreign substance would have been ejected spontaneously; nor is it at all likely that, had an operation been performed, it could have been seized and extracted with the forceps, hook, or probe; while it is almost morally certain that the morbid action in the pulmonary tissues, induced by the presence of the bur, would have been greatly aggravated by the use of the knife. By a reference to the table, it will be seen that tracheotomy has occasionally been performed as late as five, six, and even seven months after the occurrence of the accident, but in no instance, so far as I recollect, in which it was done successfully, was there any serious structural disease of the respiratory apparatus.

Although it would, as a general rule, be wrong to operate when there is serious pulmonary disease, yet there are undoubtedly exceptions; as is shown, for example, in the remarkable case communicated to me by Dr. Atlee, and detailed in another place. In this case, tracheotomy was performed at the end of about ten weeks and a half, after the formation of a large abscess in the left lung, and the existence of hectic irritation, and yet the foreign body was ejected immediately after the operation, and the patient rapidly recovered. Much, perhaps, however, of the fortunate issue of this case was owing to the fortuitous circumstance of the abscess being ruptured by the instrument which was employed to find the extraneous substance. Had this accident not occurred, the termination might have been very different; the operation might have increased the pulmonary disease, and hurried off the patient prematurely, as has doubtless happened in repeated instances, of which no report has been made to the public.

ARTICLE II.

BRONCHOTOMY.

SECTION I.

ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS.

The term bronchotomy is derived from a Greek compound, literally signifying a division of the windpipe; and, therefore, includes the operations of laryngotomy and tracheotomy, along with the various modifications suggested by different writers. A brief outline of these operations is all that will be required in a treatise of this kind, the chief object of which is to give an account of the nature and symptoms of foreign bodies, their effects upon the air-passages, and the best mode of removing them. A few remarks, illustrative of the surgical anatomy of the windpipe, must necessarily accompany this account.

The *larynx* (Fig. 17, 1), to use the language of the anatomist, may be said to be a sort of box, situated at the upper and forepart of the neck, between the hyoid bone and the trachea, with the latter of which it is continuous, both together forming what is called, in common parlance, the windpipe. Communicating with the pharynx above, it is bounded laterally by the great vessels of the neck, and resembles in its shape a truncated pyramid, the apex of which is connected with the first ring of the trachea. It is larger, relatively speaking, in the male than in the female, and is composed of a framework of cartilages, of which, in a surgical point of view, the thyroid and cricoid are the most important. These two bodies, which, especially the first, form a considerable prominence in the neck, are connected, in front, by the *crico-thyroid* membrane which is attached to their contiguous borders. This membrane, which plays so important a part in laryngotomy, or, as it has been recently termed, the crico-thyroidean operation, is somewhat triangular in shape, of a pale-yellowish color, and of a firm fibrous texture. Its length in the adult is from six to eight lines, and, of course, proportionably less in infancy and childhood.

The larynx, at the middle line in front, is covered merely by the

common integuments, that is, by the skin, cellular tissue, and cervical fascia, and is, therefore, easily accessible to the knife in its

Fig. 17.

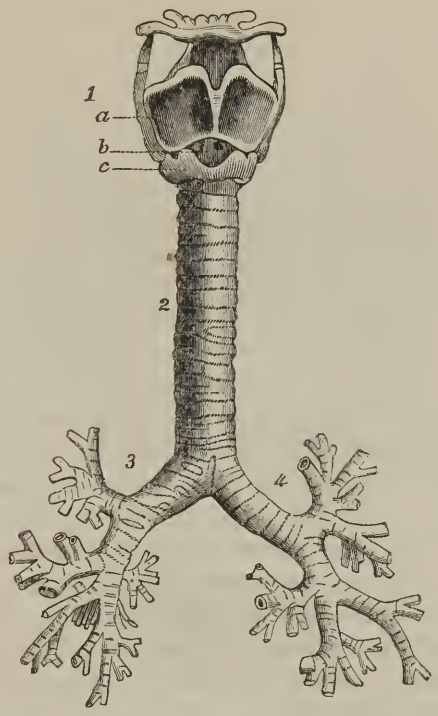


Fig. 17. Windpipe.—1. Larynx. 2. Trachea. 3. Right bronchial tube. 4. Left bronchial tube. *a.* Thyroid cartilage. *b.* Crico-thyroid membrane. *c.* Cricoid cartilage.

entire extent. Neither the platysma, myoid, the sterno-hyoid, sterno-thyroid, nor the crico-thyroid are at all interested in any of the forms of laryngotomy; for, as these muscles ascend along the neck, they are separated from each other by a triangular interval, broader above than below, and occupied by the crico-thyroid membrane. A small artery, a branch of the superior thyroid, and hardly as large as a darning-needle, generally runs across the anterior surface of the crico-thyroid membrane, and may, when divided, require the ligature. The posterior surface of the larynx, along the entire middle line, is covered merely by mucous membrane. Hence, if, after the common integuments have been removed from the larynx,

an incision be made through the tube from one extremity to the other, the only parts divided will be the thyroid cartilage, the crico-thyroid membrane, and the cricoid cartilage, with the mucous investment behind.

The interior of the larynx presents several objects of interest and importance in reference to the introduction and egress of foreign bodies; objects which, it need hardly be added, should be well understood by the surgeon, as much of the success of his practice will necessarily depend upon his knowledge of this portion of the windpipe. These objects are, the mouth of the larynx, the glottis and its rima, and the ventricles of Morgagni.

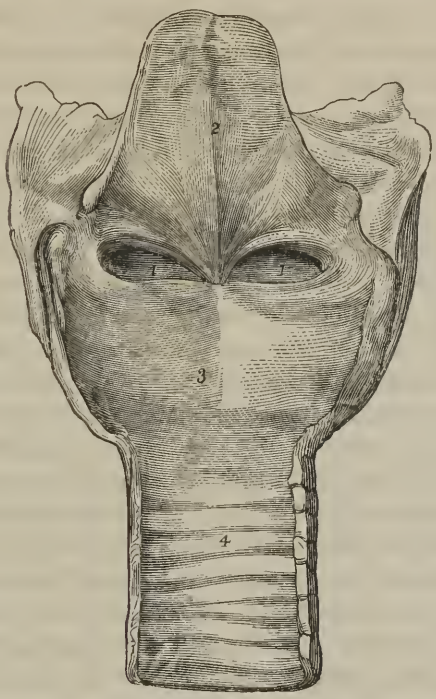
The mouth of the larynx is that portion of the tube which communicates with the pharynx; it is of a triangular form, being wide in front, and narrow behind, and corresponds with the epiglottis, which, when depressed, generally completely covers it. As it is the most capacious part of the larynx, it readily admits foreign bodies, which, from their size, cannot always easily pass through the rest of the organ, and which, becoming arrested there, often produce instant suffocation by their mechanical obstruction to respiration. This portion of the windpipe is sometimes denominated the superior orifice, inlet, or entrance of the larynx.

The *glottis* is the space between the mouth of the larynx and the vocal cords, which thus form its inferior boundary. It has the form of a long narrow fissure, running from before backwards, and gradually diminishing in size as it extends from above downwards, especially in its transverse diameter. In looking through the inferior part of this space, we see the *rima* of the glottis, an elongated triangular chink, the base of which is behind, and the sides of which are formed by the inferior vocal cords. This slit-like aperture is the narrowest portion of the canal, and is, therefore, easily choked up by foreign bodies, and even by pieces of adventitious membranes, such as are often formed during the progress of inflammatory affections, particularly croup. In the adult, it is from ten to eleven lines in the antero-posterior diameter, and from three to four in the transverse, which, however, is capable of expanding, during inspiration, to five or six lines, while, during expiration, it has the same breadth as that observable in the dead body. The size of the rima is always less, relatively, in the female than in the male.

In the interior of the larynx, between the two vocal cords on each side, is the *ventricle of Morgagni* (Fig. 18, 1), a deep, elliptical

pouch, cul-de-sac, or hollow, narrower at its orifice than in its interior, and generally about three-quarters of an inch in length in the

Fig. 18.



Larynx, laid open posteriorly. 1, 1. Ventricles of Morgagni. 2. Epiglottis. 3. Interior of the tube. 4. Trachea. (From a dissection by the Author.)

full-grown subject. This cavity, which is exceedingly small in infants and children, is of great surgical interest from its liability to entrap extraneous substances, and from the difficulty which the operator sometimes experiences in his attempts at dislodging them.

Each ventricle, at its anterior extremity, is supplied with a kind of supplementary cavity, commencing by a broad base, and terminating by a narrow point. In its shape, it is said to resemble a Phrygian cap. Its dimensions are variable. In one instance, it was found to be half an inch in its vertical diameter, but generally, it is much smaller.

The trachea (Fig. 17, 2), situated in the neck and the upper part of the chest, is continuous superiorly with the larynx, and inferiorly

with the bronchial tubes, in which it terminates, generally opposite the third dorsal vertebra. Its mean diameter is from ten to twelve lines in the male, and from nine to ten in the female. Its direction is vertical. The cervical portion, the only one necessary to be noticed here, is usually about three inches and a quarter in length, but of course varies, in this respect, according to the length of the neck. In very young children it is commonly very short, and hardly four lines in diameter. It lies immediately under cover of the sterno-hyoid and sterno-thyroid muscles, the former of which, in their ascent along the neck, are closely united to each other by a white fibrous raphé, indicating the situation of the middle line. Beneath these muscles, which are of a flat, ribbon-like shape, and generally of a deep flesh color, is a layer of the cervical fascia, and in close contact with the tube is the thyroid plexus of veins, enveloped in a small quantity of loose cellular tissue. In very fat subjects, a few granules of adipose matter are also met with here. Occasionally a small artery, the middle thyroid of Neubauer, ascends along the front of the trachea, on its way to the thyroid body, and is liable to be divided in opening the canal. In some instances, though rarely, a few small lymphatic ganglions lie directly in front of the tube; and sometimes, again, but this is also uncommon, a vein of considerable size is seen lying immediately beneath the skin, along the middle line, and consequently directly in the course of the incisions in the operation of tracheotomy. The disposition of the large vessels at the root of the neck, and their relation with the operation of tracheotomy, will be fully pointed out in another section of this work.

The lamella of the deep cervical aponeurosis which envelops the windpipe, and which may hence be denominated the *tracheal fascia*, is nothing but cellular tissue, in a somewhat condensed state. It is not sufficiently firm, however, to prevent the infiltration of air in tracheotomy, and it has, therefore, been advised, in order to guard against this occurrence, that a portion of this substance should always be excised immediately around the wound at the time of the operation. Such a step, however, I conceive to be altogether unnecessary, and even improper. All that can ever be required is a free division of the membrane, to prevent it from slipping over, and thus occluding the artificial aperture.

The trachea, as it descends along the neck, lies upon the œsophagus; while on each side it is in relation with the lateral lobe of the

thyroid gland, the great cervical vessels, the pneumogastric nerves, and several lymphatic ganglions. The superior extremity of the tube, opposite the third and fourth rings, is covered by the isthmus of the thyroid gland, which, however, varies a good deal in breadth in different cases, reaching sometimes as high up as the cricoid cartilage, or extending as low down nearly as the middle of the neck. In seventeen persons, whose ages ranged from fourteen to seventy, Mr. Ormerod,[1] of England, found the distance between the superior border of the isthmus and the inferior border of the cricoid cartilage to be from one-eighth to three-eighths of an inch. In three of the cases the gland was on a level with the cricoid cartilage. It should also be recollected that this body occasionally sends a process upwards over the thyroid cartilage. In nearly one-half of the cases examined by Mr. Ormerod, a branch of the superior thyroid artery was seen coursing along the upper edge of the isthmus. The same writer also observes that it is not unusual to find a large branch of the superior thyroid artery running down vertically from the crico-thyroid membrane, over the cricoid cartilage, to the transverse portion of the gland, and somewhat resembling, in its direction and arrangement, the thyroid artery of Neubauer; while at other times the inferior thyroid veins ascend over these structures, and even over a portion of the thyroid cartilage, to anastomose with the laryngeal and superior thyroid veins.

The space between the inferior edge of the isthmus of the thyroid body and the top of the sternum is the point necessarily selected for performing tracheotomy. The length of this space varies in different individuals, from nine lines to two inches and a quarter in the ordinary position of the neck; but it is always considerably increased, sometimes as much as an inch, or even an inch and a quarter, by forcibly extending the head. As the trachea descends towards the thorax, it gradually recedes from the surface, and in children, and short, fat-necked persons, it not unfrequently lies at a depth of from one and half to two inches. To perform bronchotomy readily and successfully, the operator should render himself perfectly familiar, by frequent touch and inspection, with the consistence and situation of the hyoid bone, the thyroid and cricoid cartilages, the crico-thyroid membrane, and the thyroid body; the course, length, and depth of the cervical portion of the trachea, and its relation to

[1] Clinical Collections and Observations in Surgery, pp. 182–3. London, 1846.

the great vessels of the neck, and the thyroid plexus of veins; and, finally, the changes produced in the windpipe by the position of the head.

The trachea is naturally very small in infancy and childhood; and it is amazing, when we look at this circumstance, to find how large a foreign body may enter the tube at these periods of life without producing instant suffocation, or even, in some cases, any very severe symptoms. Beans, grains of corn, pebbles, and other substances, sufficiently voluminous to fill the tube, have often entered it, and even been retained for a long time, with comparatively little distress to the patient.

The trachea is occasionally abnormally small, either as a congenital vice, or as a result of disease. In the latter case, which is often associated with lesion of the heart and lungs, the contraction sometimes begins early in life, and gradually proceeds until it materially encroaches upon the caliber of the tube; so that it may, at length, hardly admit the end of the little finger. When the diminution is very considerable, whether it be limited to a portion of the canal, or affect its entire length, the patient, in the event of his inhaling a foreign body, would be very apt either to be instantly suffocated, or, at any rate, to suffer much more severely than a person in whom no such conformation exists.

The *bronchial tubes* (Fig. 17, 3 and 4) present several points of interest worthy of brief notice, in relation to the entrance and disposition of foreign bodies. We have already spoken of the septum (Fig. 1, 4[1]), which marks their junction, and which plays so important a part in accidents of this description. It is evidently formed by a duplicature of the lining membrane, of a crescentic shape, the centre of which is concave, while the extremities are attached to the anterior and posterior parietes of the trachea. This arrangement is best seen by looking into a section of the trachea, from above downwards, after having cut off the anterior wall of each bronchus, so as to permit the light to fall fully upon the part in question. When thus examined, its position will be found to be such as divide, as it were, the inferior extremity of the trachea into two unequal halves, of which about three-fifths belong to the right side, and the remaining two-fifths to the left; a circumstance which admirably accounts for one of the reasons, already repeatedly re-

[1] See page 46.

ferred to, why foreign bodies, in their descent from the larynx, are so much more liable to pass into the right than into the left of these tubes.

The bronchial tubes differ from each other, materially, in several other respects, which likewise exert, as is supposed, and doubtless very justly, a decided influence upon the occurrence under consideration. Thus, in the first place, they are not of the same length and capacity. The right is rarely more than twelve lines in length, while the length of the left is almost always nearly two inches. The former is also much more capacious than the latter, and therefore capable of admitting and accommodating a much larger foreign substance, without necessarily inducing any greater amount of respiratory embarrassment in the corresponding lung. It may be stated, in general terms—for it is impossible to arrive at any very certain conclusions upon the subject—that the diameter of the right tube is only about one-fourth less than that of the trachea, while the diameter of the left is hardly more than half the diameter of that canal. These circumstances, together with the more horizontal direction of the right bronchus, have induced some anatomists to consider it as the direct continuation of the trachea, which, however, is not the fact; the true reason being the greater volume of the corresponding lung. In their shape, the tubes perfectly resemble the trachea, being flattened behind, and convex in front and at the sides.

As intimately connected with the above sketch of the anatomy of the windpipe, and the effects of foreign bodies, it will not be amiss here to make a few remarks upon the difference between the *sensibility* of the larynx and that of the trachea. This difference is real and distinct, as has been abundantly proved both by experiments upon the inferior animals and observations upon the human subject. Mons. Magendie[1] ascertained that if an opening be made into the windpipe, and a probe be passed up into the glottis, violent irritation and coughing are produced, while no such effect follows the introduction of the instrument into the trachea and bronchial tubes. The same fact has been witnessed in operations for the relief of obstructed breathing, whether occasioned by a foreign body, a false membrane, wounds, paralysis, or spasm of the tube. A canula is much more easily introduced into the trachea than into the larynx, as well as more easily retained in it.

[1] London Medical Lancet, vol. ii. p. 505, 1836–7.

Upon repeating, a short time ago, the experiments of the French philosopher, I ascertained that the sensibility of the bronchial tubes is much greater than I had been led to infer from his statements. Whenever the probe, which was quite long, and blunt at the extremity, was passed into either of these tubes, or into some of their primitive divisions, the animal immediately began to cough, and to evince symptoms of great uneasiness. The sensibility of the trachea, on the contrary, was very slight, the animal suffering apparently but little, if any, discomfort, even from the rude and prolonged contact of the instrument. Carried into the larynx, the probe never failed to excite intense distress; the muscles of the neck were instantly thrown into severe spasm; and the animal not only coughed, but he foamed at the mouth, and struggled violently for breath, raising himself off the table, and evincing every sign of impending suffocation. These experiments, which were repeated several times upon three different dogs, and always with the same results, lead to the conclusion that the greatest degree of sensibility of the air-passages resides in the larynx, and the least in the trachea; or, in other words, that the amount of sensibility is greater at each extremity of those passages than it is in that portion of the tube which intervenes between them.

To ascertain what influence, if any, chloroform would exert upon the sensibility of the different portions of the air-tubes, I requested my friend, Dr. Thomson, to administer this article; while, as soon as it had produced the desired effect, I irritated, in the same manner, and with the same instrument, as in the preceding experiments, the mucous membrane. As I had been led to anticipate from my observations upon the human subject, every particle of feeling seemed to be destroyed, and the probe could be pushed freely up and down the passages without exciting the slightest uneasiness. In fact, the animal seemed to be wholly unconscious of what I was doing, even when the instrument was carried most rudely through the larynx up into the fauces.

The following experiments, performed in 1843, by Mr. John E. Erichsen,[1] of London, while they fully confirm those of Mons. Magendie, throw additional light upon this branch of the subject.

The trachea of a dog was laid open to the extent of about one line, midway between the sternum and the larynx. The animal

[1] London Medical Gazette, vol. ii. p. 556. 1843.

continued to breathe through the glottis, as the artificial aperture was too small to admit of the escape of much air. A small bent probe was then inserted, and passed upwards, without exciting any irritation, until it reached the larynx, when it induced severe coughing and convulsive action of the respiratory and cervical muscles, the larynx being forcibly moved up and down. The dog foamed at the mouth, struggled violently, and exhibited all the signs of approaching suffocation. These phenomena ceased the moment the instrument was withdrawn, but always reeurred when it was reintroduced. The experimenter ascertained that, although coughing was provoked when the probe was passed downwards into the lungs, it was not so intense as when the instrument was directed upwards, nor were the struggles so severe. Upon pushing the instrument through the rima of the glottis, the distress was so much increased, and the danger from asphyxia so imminent, that the effort had to be immediately discontinued.

In another experiment, in which the windpipe was opened to the extent of nearly an inch, and in which, consequently, the animal was placed in the condition of a person on whom tracheotomy has been performed, similar effects were produced by the passage of the instrument. The respiratory and cervical muscles contracted with great violence, but the attempts at coughing were less perfect, as the air was not forced through the glottis, but escaped at the artificial orifice. It was also observed that there were none of those symptoms of asphyxia which were present, in so remarkable a degree, in the other experiment; owing to the fact that, although the irritation of the extraneous body produced the same spasmodic action about the glottis, the respiration was carried on fully through the wound in the neck.

In a third experiment, in which the trachea was completely severed, after a pipe had been fastened into the lower portion of it, so as to maintain uninterrupted breathing, the introduction of a probe into the glottis produced precisely the same phenomena as in the second experiment; the respiratory and cervical muscles being thrown into powerful action, and the imperfect attempts at coughing usually terminating in convulsive expiratory efforts.

From these experiments, which were repeated upon five different dogs, and several times upon each animal, Mr. Erichsen thinks himself warranted in concluding that the existence of an opening in the trachea, sufficiently free to allow of respiration being car-

ried on through it, or, indeed, complete division of this tube, does not, materially, if at all, diminish the sensibility and contractility of the glottis. "When a foreign body, therefore," says he, "accidentally introduced into the air-passages, escapes through the glottis without exciting spasmodic contraction of its muscles, or reflex movements in those of respiration generally, after an opening has been made in the trachea, it probably does so in the same accidental way that it entered; the sensitive parts through which it passes being, as it were, taken by surprise, whilst the attention of the patient is directed to the artificial opening, or to the circumstances in which he is placed. It would probably be as difficult for a patient —whether his trachea were opened or not—to expel a foreign body through his glottis, if his attention were fixed upon that part whilst he made the attempt, as it would be for him, *voluntarily*, to introduce it into the air-passages through the same aperture. There is, however, this most important difference between the presence of a foreign body in the larynx, or at the glottis, before and after tracheotomy has been performed, that, although the sensations of local irritation, and the reflex movements consequent upon them, may in both instances be the same, yet danger from asphyxia can necessarily only occur in those cases in which the glottis is the sole aperture through which respiration can be carried on."

Although, in health, the sensibility of the trachea is much less than that of the larynx, yet, in disease, the difference is frequently very slight, if, in fact, at all appreciable. Hence, in operating for the relief of foreign bodies, the most delicate manipulation with the probe and forceps may excite so much irritation, as to compel the surgeon instantly to desist for fear of inducing suffocation. Quite a number of the cases detailed in this work, to say nothing of my own experience, fully corroborate the truth of this remark. The sensibility of the tube seems to be, sometimes, if not frequently, morbidly increased by the impression which the extraneous substance exerts upon the mucous membrane, in the same manner as the eye may, from similar causes, be rendered morbidly sensitive to light, the throat to air, or the stomach to food. On the other hand, the natural sensibility, instead of being augmented, may be materially diminished, if not completely annihilated; as happened in several of the cases mentioned in this treatise, and in the very remarkable instance recorded in the *London Medical Gazette*, for

1843.[1] A man had some chronic disease of the larynx which obstructed respiration. The trachea having been opened, a long tube was introduced, and worn for a great while without any inconvenience. Indeed, so destitute was the mucous membrane of sensibility, that the man habitually relieved himself from occasional attacks of dyspnœa, by passing a long turkey feather down into the very depths of the chest, and drawing up from thence long strings of tough mucus, without producing the slightest irritation, cough, or other distress. These facts are of great practical interest, and deserve to be remembered in connection with the extraction of foreign bodies.

The sensibility of the glottis, which plays so important a part in foreign bodies in the windpipe, resides in the superior laryngeal nerves, as was long ago proved by Magendie,[2] in his experiments upon dogs. On severing these nerves on both sides, he found that the interior of the larynx was no longer capable of taking cognizance of the presence of extraneous substances, whereas the division of the inferior pair did not affect it in the slightest degree; the passage of a probe through the glottis causing cough and irritation, as in the natural state of the parts.

SECTION II.

HISTORY OF BRONCHOTOMY.

It would be difficult, if not impossible, at this day, to determine, with any degree of accuracy, when, or by whom, bronchotomy was first actually performed on the living subject for the removal of foreign bodies from the air-tubes. There appears, however, to be good reason to believe that it was not until a comparatively recent period. It is certain, as is shown by the subjoined passage, that Theophilus Bonetus, the great pathological anatomist, recommended the operation at the middle of the seventeenth century, in the case of a boy who had inhaled a small piece of bone. Unfortunately, however, he was overruled by the medical attendant, and the child died from the effects of the accident. "Puer septennis," says

[1] Dr. Burridge's Letter, Lond. Med. Gaz. vol. ii. p. 324.

[2] London Medical Lancet, vol. ii. p. 506. 1836–7.

Bonetus,[1] "Aurifabri Genenensis Dom. Ganier filius, anno 1650, oryzam juri carnium incoctam comedens, ossiculum deglutit, quod à consueto tramite deerrans, asperam arteriam subit, illi impactum hærens, digito locum designabat, circa colli medium: hinc difficilis cum tussi anhelitus, maxime in inspiratione, dolorque punctorius: cum nec progredi nec negredi ossiculo daretur, bronchotomiam suasi, alteri medico ineptam visam, et sexto demum die, sed ab obitu factum: exemptumque os teres, æreæ monetæ crassitie, triplici angulo parietibus arteriæ asperæ affixum: spes erat salutis in mature instituta operatione."

The first recorded case of this operation is detailed by Verduc, in his *Surgical Pathology*, published at Amsterdam, in 1717. The patient had inhaled a fragment of bone, which was extracted through a free incision in the trachea. Lawrence Heister,[2] whose *General System of Surgery* was issued at Helmstadt, in 1739, after describing the operation, expressly states that it had been neglected by modern surgeons, meaning, of course, his contemporaries. He refers to a case in which, by its performance, he happily extracted a piece of boiled mushroom, which had accidentally slipped into the windpipe of a "jocose man," while in the act of eating broth, and which came very near strangling him. His countryman, Rau, had, it would seem, by the same process, relieved a patient of a bean. It deserves to be mentioned here, that Nicholas Habicot,[3] surgeon to the Hôtel-Dieu, of Paris, early in the seventeenth century, performed bronchotomy successfully, in the case of a young man who was on the point of being suffocated from the entrance of a large quantity of blood into the trachea, in consequence of a wound of the larynx. He had previously performed a similar operation upon a youth, who, fearing he should be robbed, swallowed several pieces of coin, which stuck fast in his œsophagus, and so compressed the windpipe as to render it almost impossible for him to breathe. Wendt,[4] a professor at Erlangen, born in 1738, performed bronchotomy upon a young girl, into whose trachea half an acorn had dropped, where it occasioned the most violent symptoms, threatening instant suffocation. He opened the tube by dividing its first three rings, and

[1] Sepulchretum sive Anatomia Practica, t. i. lib. 2. De Respiratione Læsa, obs. i. p. 483, Genevæ, 1700.

[2] Heister's General System of Surgery, vol. ii. p. 52; eighth ed., London, 1768.

[3] Question Chirurgicale sur l'operation de la Bronchotomie, p. 40, Paris, 1620.

[4] Historia Tracheotomiæ nuperrimé Administratæ, in 8vo. Vratislaviæ, 1774.

then, separating the edges of the wound with a pair of blunt hooks, he readily extracted the foreign substance.

In April, 1759, Mons. Louis presented to the Royal Academy of Surgery, of Paris, of which he was one of the most learned, scientific, and illustrious members, his Second Memoir on Bronchotomy. In this paper, so celebrated in the annals of surgery, the author treats of the existence of foreign bodies in the trachea, details, with great care and minuteness, all the important facts that had transpired with regard to this subject up to the time at which he wrote, and declares himself as a warm and decided advocate of the operation of bronchotomy in cases of this accident. In drawing up his paper, which was subsequently published in the fourth volume of the Memoirs of the Academy, he did not hesitate to avail himself freely of the labors and observations of his predecessors and contemporaries, wisely concluding that the experience of one man, however great or diversified, was too limited to enable him to do justice to a subject so important in a surgical point of view, and so fraught with interest to the welfare of the human race.

"The majority of the cases," says Mons. Louis, "handed down to us by former practitioners, of foreign bodies in the respiratory tube, contain little more than a recital of the melancholy termination to which the accident gave rise. It would even seem, from the manner in which they are related, that it was deemed impossible to deduce from them any principles which should serve as guides of practice in this branch of surgery. The subject, however, is one of the most important that can be treated of. Humanity demands that we should render our aid in circumstances which may end fatally, and to which we are all daily liable. In the whole domain of our art there is no situation in which our kindness and skill can display themselves in so brilliant a manner. The case which occurred to me about a month ago, will, if I do not much mistake, tend to throw considerable light upon the subject. I know that one man's experience is too limited; but the observations of our predecessors cannot serve instead of rules for our guidance, seeing that they have neglected to detail with accuracy the different circumstances they witnessed. It is hardly possible to imagine how so much negligence could have been exhibited in a matter so well deserving of the greatest attention. Our resource, then, must be in the number of the facts which may enable us to supply the deficiencies of one narrative from the details of others; and we shall thus endeavor

to obtain full and authentic information from the examination and discussion of a number of cases, although they may be wanting in the qualities which should characterize good observations."

The paper of Mons. Louis was the first, of a practical character, that had ever been published on foreign bodies in the air-passages; and its effects upon the minds of his contemporaries, both in France and elsewhere, may well be imagined from the exalted reputation of its author. It is one of his most masterly performances, and may be justly regarded as one of the most valuable contributions that have ever been made to this department of the healing art.

The experiments of Mons. Favier,[1] of Paris, performed in 1771, no doubt exerted an important influence upon the minds of surgeons in regard to the propriety of this operation, which, until then, as was before stated, had been greatly neglected. They proved, in the most incontestable manner, how easily, in the majority of instances, foreign substances, lying loose in the windpipe, are ejected the moment an adequate incision is made into that tube, by the mere expulsive agency of the air in the lungs. These experiments, some of which I have repeated, and the accuracy of which I have verified, are so interesting that I must be excused for giving a brief account of them in this place.

Having muzzled a large dog, Favier made an incision through the skin and muscles under the lower jaw, sufficiently large to allow the tongue to be drawn out at the wound. Watching the moment of inspiration, he pushed into the windpipe, through the glottis, a very rough, round piece of china-root. Vomiting instantly ensued; the breathing became very laborious; and great apprehension was felt that the dog would perish in convulsions. The alarming symptoms, however, subsided in a few minutes; but the relief was very transient, for the suffering was soon renewed, especially when the animal was subjected to any motion.

Six hours afterwards, Favier performed bronchotomy by dividing three of the rings of the trachea. The bistoury had hardly been withdrawn, when a strong expiration forcibly expelled the foreign body through the wound. It was again introduced, and pushed by means of a probe as far as possible into one of the bronchial tubes, from which it was again ejected in the same manner and with the same promptness as before. A similar result followed

[1] Mémoires de l'Académie Royale de Chirurgie, t. v. p. 356. Paris, 1819.

a third trial. Favier noticed that in inspiration the foreign body was drawn below the wound, while in expiration it was chased towards it. This experiment was repeated altogether ten times, and uniformly with the same effect. The edges of the wound were then approximated, and maintained by suitable dressings; the dog was fed on milk for eight days, and in three weeks he was perfectly well, never having experienced the slightest untoward symptom.

Some time afterwards, Favier repeated his experiments in the presence of Mons. Sabatier, who, in his report to the Royal Academy of Surgery, asserted that all substances, whatever might be their shape, were, when introduced into the trachea of a living dog, forcibly expelled after the operation of bronchotomy, even after they had been pushed into the bronchial tubes. He testified that he had seen pebbles, rough as well as smooth, instantly ejected to a great distance after they had been deeply buried in the air-passages, and he assured his associates that the result was the same whether the animal was lying down, or standing up.

From these experiments Favier concluded, *first*, that the difficulty of finding and extracting the foreign body was a mere pretext, intended to countenance the opposition which timid practitioners had urged against the operation of bronchotomy, in cases where the intruder had descended into the trachea, and occasioned serious embarrassment in deglutition; *secondly*, that the extraneous substance was drawn towards the bronchial tubes during inspiration and forced towards the glottis during expiration; *thirdly*, that these alternate movements, excited by the presence of the offending body, favored the escape of this body by the artificial opening; and, *lastly*, that the knowledge thus derived would, if properly applied, be instrumental in saving the lives of many persons, who would otherwise fall victims to this accident. The validity of these conclusions has been amply corroborated since the time of Favier, by observations upon the human subject, and has led to the establishment of the important practical precept to resort to bronchotomy, in all cases, the moment it is known that there is a foreign substance in the windpipe.

SECTION III.

LARYNGOTOMY.

Laryngotomy, as may be perceived from the preceding sketch of the anatomy of the windpipe, is, on the whole, a very simple and easy operation. The only structures that are divided are the skin, the cervical fascia, and the crico-thyroid membrane. If the patient is an adult, he may sit upon a chair, or, what is preferable, especially if he take chloroform, he lies upon a narrow table, the head and shoulders being properly elevated and horizontalized[1] by pillows. If, on the contrary, he is a child, he should be supported upon the lap of an assistant, and his body and limbs should be securely fastened with an apron, very much as in the operation for harelip. The head is thrown backwards and held by another assistant, in such a manner as to render the parts prominent and make the chin look directly forward in the direction of the middle line. Armed with a small, narrow scalpel, the surgeon, stationed in front of the patient, if he sits, or by his side, if he is recumbent, makes an incision directly along the centre of the larynx, commencing at the top of the thyroid cartilage and terminating at the base of the cricoid. In the adult, the length of this incision will be fully one inch and a half, and hardly any less in a thick, short-necked child. It embraces the skin and cervical fascia, and usually also the crico-thyroid artery. Should this vessel bleed, it must either be forcibly twisted or secured with the ligature, lest the blood should find its way into the windpipe, and thus occasion severe cough, if not suffocation. All that now remains to be done is to divide the crico-thyroid membrane, in its whole extent, in the direction of the cutaneous wound. Should the opening not be sufficiently large, the incision may be prolonged into the contiguous cartilages, or a piece of the membrane may be cut away on each side of the wound. Some surgeons prefer making a crucial incision, and such a proceeding is quite proper where it is desirable to afford free play to the instruments without interfering with the thyroid and cricoid cartilages.

[1] Such a term has long been needed in surgery, a circumstance which is my only warrant for employing it on this occasion.

SECTION IV.

TRACHEOTOMY.

If the operation of laryngotomy is simple and easy, it is far different with that of tracheotomy. This is particularly true with regard to tracheotomy in children with short, thick necks, to say nothing of the cries and struggles which they are sure to make if they are not under the influence of chloroform, or nearly choked by the foreign body. I know hardly an operation in all surgery that I would not rather undertake than this under such circumstances. The amputation of a limb, the extirpation of a glandular tumor, lithotomy, and even the perineal section are trifling matters in comparison with tracheotomy in a short, thick-necked, and restive child. I was not a little surprised, some years ago, at hearing a former colleague, the then professor of medicine in the University of Louisville, speak of this operation as the most simple thing in the world, which any one who is not even a surgeon might easily perform with a razor! I have not learned whether my friend ever opened the trachea; if he has, he would not, I am sure, have hazarded such an erroneous statement. The operation is easy enough on the dead body, and may be done with almost any instrument; but on the living subject it is a very different affair. Here, it requires not only a thorough knowledge of the anatomy of the parts, but the nicest care and the most delicate dissection. I am not singular in my views upon this subject; the difficulty in question has been experienced a thousand times, and that, too, by the most dexterous and accomplished operators. The use of anæsthetic agents will, undoubtedly, greatly facilitate the performance of this operation, and divest it of much of the dread which surgeons have always so justly entertained respecting it. Chloroform and chloric ether have been already employed with the happiest effect, in a considerable number of cases, and no one who has once administered these articles will be likely to dispense with them. My own experience, limited as it is, fully satisfies me of their value, and even of their indispensable importance in all operations of this kind; but as this is a subject to which I shall presently recur, I forbear any further remarks concerning it in this place.

Owing to the uncertainty of the diagnosis of foreign bodies in the larynx, this portion of the tube should, I think, seldom be opened if it be possible to employ tracheotomy. The latter operation, although much more difficult, has the advantage, in many instances, of enabling the lungs to expel the offending substance, however high it may be situated, and of affording the surgeon ample opportunity of dislodging it with his mop and other instruments when it occupies the larynx. Nothing can be more embarrassing to him than to be obliged to open the windpipe, first, at its superior, and afterwards at its inferior division. It is only, in fact, when he has the most indubitable evidence of the existence of the object in the larynx that he should open the crico-thyroid membrane. In no case, except of the most extraordinary character, ought he, in my judgment, to divide the thyroid and cricoid cartilages, particularly the former, on account of its intimate relation with the vocal cords, and the consequent risk of injuring the voice. The latter is so near the thyroid gland, and so far from the bronchial tubes, that an attempt should always be made, if practicable, to avoid it. An opening midway, or nearly midway, between the sternum and the larynx is, as a general rule, far preferable to any other, inasmuch as it puts the operator in sufficient proximity with each extremity of the canal, and thus affords him a favorable opportunity of dislodging the foreign body, whether situated in the larynx, floating about in the trachea, or impacted in one of the bronchial tubes.

In performing the operation of tracheotomy (Fig. 19), the same general rules are to be observed as in laryngotomy. The position of the patient and surgeon, the instruments and assistants, are all the same. An incision is made through the common integuments, directly along the middle plane, extending from the base of the cricoid cartilage to within a quarter of an inch of the top of the sternum. The sterno-hyoid and sterno-thyroid muscles of the opposite sides are next separated from each other at their raphé, by a cautious use of the handle of the knife, aided, if necessary, by the point of the instrument, when the cervical fascia and the thyroid plexus of veins will be fully brought into view. The former is divided in the same careful manner, while the latter is pushed aside, and protected by a blunt-hook. If the middle thyroid artery is cut, which, however, is a rare contingency, it must be instantly secured. The isthmus of the thyroid gland, even when it descends

considerably lower than usual, will seldom embarrass our progress; should it do so, it must be held out of the way, although it

Fig. 19.

has sometimes been divided with impunity. Professor Van Buren, of New York, informs me that he has completely divided this process on several occasions without the slightest loss of blood, mischief, or inconvenience. Generally, however, it will be well enough to avoid it, by holding it out of harm's way; should this, however, be impracticable, any bleeding that may be apprehended can be effectually avoided by embracing the part in two ligatures, the knife being afterwards carried between them. Under ordinary circumstances, however, such a proceeding will be quite unnecessary, as, in the event of hemorrhage, it would be very easy to apply the ligatures after the division has been effected.

Seeing that there is no bleeding, or any blood at the bottom of the wound, the surgeon steadies the trachea with the left index-finger, or, what is more effective and more satisfactory, with a tenaculum, and divides at least three of its rings. In executing this step of the operation, the knife is entered at a right angle to the surface of the tube, with its back towards the sternum, care

being taken to cut from below upwards, lest injury be inflicted upon the great vessels at the root of the neck. The incision in the trachea must strictly correspond with the centre of the external wound, and should be at least from nine lines to an inch in length. If shorter than this, it will scarcely suffice for the spontaneous ejection of the foreign body, or, when this does not happen, for the proper play of the forceps.

One, of my old friends and classmates, Professor Gilbert,[1] of Philadelphia, has recently, in several instances of tracheotomy, made the opening on the left side of the tube, about two lines from the middle plane, so that the orifice was completely closed by the overlaying muscles and fascia. He was led to adopt this method from the fact that, in the ordinary operation, the patient has occasionally perished from the introduction of blood into the trachea after the wound is closed externally. The aperture in the tube is thus protected as if by a valve, and the divided parts usually unite by the first intention. In one of Professor Gilbert's cases, secondary hemorrhage came on a few hours after closure of the wound, but the blood escaped outwardly, and the respiration consequently remained perfectly free.

Of the propriety of this operation I know nothing from personal experience; I should suppose, however, that it was ill calculated to answer the purpose where the object is to promote the extrusion of a foreign body, inasmuch as the valve-like character of the tracheal wound would necessarily oppose an irresistible barrier to its passage after the parts have resumed their natural position. Where the substance is expelled instantly, it would perhaps be preferable to the ordinary method. A similar operation was proposed about twenty-five years ago by Dr. Jones Quain, of London, but so far as I know was never performed by him on the living subject.[2]

No surgeon at the present day would think of opening the trachea transversely. Such a procedure was occasionally resorted to in former times, and an instance in which it was employed is narrated in the present treatise. It occurred in the practice of Dr. Peter P. Woodbury, by whom it has been reported in the fourteenth volume of the *New England Journal of Medicine and Surgery*. The operation was begun by opening the trachea transversely, but find-

[1] Amer. Journ. Med. Sciences, New Series, vol. xxi. p. 74, 1851.

[2] Elements of Anatomy, first edition, London, 1829.

ing that the wound did not afford sufficient space, he divided the cartilaginous ring immediately above the incision, when the air rushed into the lungs with great force, and soon afterwards the foreign body, a bean, was ejected at the mouth to some distance from the patient.

SECTION V.

LARYNGO-TRACHEOTOMY.

In performing laryngotomy, it not unfrequently happens that the opening afforded by the division of the crico-thyroid membrane is inadequate for the purpose for which it was made. In this event it may be very readily enlarged to the requisite extent, by dividing the cricoid cartilage and one or two of the upper rings of the trachea. The operation, thus performed, has been denominated laryngo-tracheotomy, as denotive of the parts concerned in it. The chief objection to it is the danger of wounding the isthmus of the thyroid gland, and the branch of the superior thyroid artery, which so frequently courses along its upper border.

When the foreign body is so firmly impacted in the larynx as to render it impossible to remove it by the ordinary operation, we may adopt the advice of Desault, and divide the thyroid cartilage in its whole length along the middle line. This proceeding was deemed necessary in a case recently under the observation of Professor Mussey,[1] of Cincinnati, in consequence of the lodgement of a cockle-bur in the ventricle of Morgagni. The crico-thyroid membrane and cricoid cartilage had been previously divided, and repeated attempts made to extract the offending body, but without success. The bur was half an inch in length, and covered with sharp, stiff prickles. The wound healed kindly, and the voice, which had been absent before the operation, suddenly returned on the twenty-first day after it.

SECTION VI.

GENERAL CONSIDERATIONS ON BRONCHOTOMY.

There are several circumstances connected with these operations demanding brief notice.

[1] Transactions of the Amer. Med. Association, vol. iii. p. 362, 1850.

In the *first* place, as soon as the operation of bronchotomy is completed, the head should be released from its constrained position, and inclined towards the chest, at the same time that the patient is turned upon his abdomen, with the face towards the floor. The object of this movement is to relax the edges of the wound, so as to afford a freer passage for the escape of the foreign body, and also for the discharge of any blood that may have accidentally entered the windpipe. The head of the patient should also be inclined forwards during our attempts at extracting the offending substance, as the forceps, and other instruments, can thus be much more easily introduced and moved about than when the head remains in the extended position which it occupies during the operation. These precautions are of great importance, and should, therefore, never be neglected.

Secondly. These operations are not equally applicable in all cases. Laryngotomy, for instance, is, in great measure, restricted to the removal of foreign bodies impacted in the rima of the glottis, lodged in the ventricle of Morgagni, or stretched across the upper part of the tube, just below its mouth. In such circumstances, independently of the great facility and safety of its performance, it possesses decided advantages over tracheotomy. The only exception to this remark is in the case of very young children, in whom the cricothyroid space may be so small as not to afford sufficient room for the easy play of the instruments required for extracting the extraneous substance. But even this difficulty may, in general, be readily overcome by cautiously prolonging the incision through the cricoid cartilage, and even through the superior rings of the trachea. Tracheotomy, on the contrary, is to be preferred when the foreign body moves up and down the windpipe, or when it is impacted in one of the bronchial tubes. Laryngotomy, it is true, might, in either of these cases, be followed by the ejection of the intruding substance, but little aid could be afforded if it were necessary to use the forceps.

Thirdly. It can rarely, if ever, be necessary to divide the thyroid cartilage; certainly, not in its entire length. Any foreign body, lodged in the cavity of the larynx, or impacted in one of its ventricles, may, with proper care, be seized and extracted through the artificial opening, or dislodged and pushed into the throat. The larger the object, the more readily will this be likely to be accomplished. The complete division of the thyroid cartilage is always

an ugly proceeding, to say nothing of the risk which the patient incurs in regard to the loss of his voice.

Fourthly. Great care is to be taken not to permit any blood to enter at the artificial opening, as the smallest quantity of this fluid may not only induce violent cough and spasm, but instant suffocation. The best plan to avoid this occurrence is not to injure any vessels, but to hold them carefully out of harm's way; or, where this is impracticable, to wait until all hemorrhage has ceased before we penetrate the windpipe. There are few cases which do not admit of such delay. Should the accident take place, despite our best endeavors to prevent it, the patient must be instantly turned upon his abdomen, and, if necessary, the blood must even be sucked out of the tube by applying the mouth to the wound. It is worthy of remark that the thyroid veins, which are generally so much distended in consequence of the difficulty of breathing and the struggles of the patient, often cease to bleed the moment the windpipe is opened and the air is freely admitted into the lungs.—For further remarks on this subject the reader is referred to the article on Hemorrhage.

Fifthly. When the artificial aperture is of proper size, the offending body, unless firmly impacted, will often be expelled the moment the incision is made into the windpipe, by the force simply of the upward current of air. Not unfrequently, indeed, it will be projected to a considerable distance, either through the wound or through the natural passage. At times, however, the result is not so fortunate; the substance remains impacted, or, if it is loose, it does not find the vent made for its escape. In such a case, search is made for it, with a view to its seizure and extraction, the manner of doing which will claim attention elsewhere.

Sixthly. I do not think that it is advisable, in any case, to widen the wound in the trachea by excising a portion of its edges, so as to impart to it an elliptical form. Such a proceeding, which the use of the blunt-hook renders entirely unnecessary, might have the effect of producing serious, if not incurable, contraction of the tube, and should, therefore, be studiously avoided. If the precaution be taken of making the wound quite long, and of keeping the head of the patient inclined well forward, the foreign body will, in nine cases out of ten, have ample room to escape at the artificial aperture during the efforts of coughing, which are always sure to follow tracheotomy.

Seventhly. Equally objectionable, in my judgment, is the use of the

canula after this operation. In several of the cases detailed in this work, such a course seems to have been pursued. In an operation performed, a few years ago, by Mons. Jobert, of Paris, upon a lady who had, six days previously, inhaled a prune-stone, a double canula was introduced immediately into the wound without any attempt to search for the offending body. Subsequently, the instrument was withdrawn every morning, and a probe introduced into the right bronchial tube to excite coughing, in the hope of expelling the intruder. In an instance which recently occurred in the hands of Dr. W. H. Mussey, of Cincinnati, a similar plan was adopted, all but the tickling process of the French surgeon. The case was attended with some peculiar features, which might, perhaps, have rendered the proceeding proper. The patient, a boy, aged seven years, was menaced with suffocation from the inhalation of a piece of bone, and at the moment of the operation he was actually in a state of unconsciousness. Much blood and mucus entered the tube, which were sucked out by the mouth, when a canula was introduced into the wound, and artificial respiration commenced. This being maintained for half an hour, the child was sufficiently recovered to be trusted to his own efforts. The instrument was retained for the next two days, but was obliged to be withdrawn every six or eight hours to be cleaned, on account of the abundant secretion of mucus, and to exercise the patient in coughing in order to clear the air-passages. At the end of this period, in one of these efforts, a fit of coughing ensued, in which the substance was ejected at the wound. In the case of Mr. T. G. Geoghegan, of Dublin, the canula was used to arrest a copious flow of venous blood which rapidly entered the trachea, and threatened instant suffocation. The wound around the instrument was plugged with sponge, with the immediate effect of arresting the bleeding. The foreign body was not removed until thirty-six hours after the operation, and the patient died on the fifteenth day from the presence of thick viscid mucus in the air-passages. Mr. James Spence, of Edinburgh, met with an instance where the canula seemed to be necessary to enable the patient to breathe freely. The moment the instrument was withdrawn the respiration became greatly embarrassed, and the child was threatened with suffocation. Notwithstanding its employment, however, the patient died exhausted in about thirty-six hours after the operation, unrelieved of the foreign body, which was found impacted in one of the divisions of the left bronchial tube.

It is difficult to perceive the philosophy of a practice, the inevitable effect of which must be to prevent the ejection of the foreign substance by opposing a mechanical obstacle to its ascent in the windpipe. One would suppose, moreover, that its presence in the tube would greatly embarrass the entrance of air, and the escape of mucus and blood. In using it, the caliber of the trachea must necessarily be materially diminished, and the patient compelled to breathe through one opening instead of two, as when the parts are left to themselves. Again, if the canula be employed to arrest hemorrhage by compressing the edges of the wound, that end may be quite as readily and as advantageously attained by the use of the blunt-hook hereafter described. Considering that the object of the operation is the expulsion of the offending body, nothing should be done after it has been performed to delay, much less to prevent, so desirable an event. On the contrary, every effort, consistent with the patient's safety, should be made to promote it; and for this purpose the wound, as was before stated, should be maintained in as free and unembarrassed a condition as possible.

SECTION VII.

ADMINISTRATION OF CHLOROFORM.

Few surgeons, acquainted with the properties of this article and the mode of administering it, will hesitate to employ it in this operation. For my part, I cannot but regard the application of chloroform to this branch of surgery as one of the most valuable and important that have yet been suggested. I am sure I should not, myself, omit it in any case; for it is difficult to conceive of one where it would be inadmissible, and it is hardly possible to recommend it too highly or too strongly to the notice of the profession.

It would not, perhaps, be easy to determine by whom anæsthetic agents were first used in bronchotomy; but there is reason to believe that, at least in this country, the late Dr. J. Kearny Rodgers, of New York, and Dr. William Davidson, of Madison, Indiana, are entitled to that credit. To which of these gentlemen the merit of priority actually belongs I am unable to state. From a communication addressed to me by Professor Van Buren, it appears that Dr. Rodgers performed the operation of laryngotomy, while his patient was under the influence of chloroform, on the 18th of Janu-

ary, 1848. It is added that this agent caused a good deal of congestion of the head and neck, leading to considerable hemorrhage, and the necessity of tying several vessels; occurrences, which, however, might have been mere coincidences. What is remarkable, no foreign body was discovered, and the patient was dismissed unrelieved.

The case of Dr. Davidson—the first of the kind, I believe, ever published in the United States—is reported in the *Western Lancet* for May, 1848, but I am unable to give the precise date of the operation. The patient, a boy four years of age, had inhaled, two days previously, a grain of corn. A handkerchief, wet with thirty drops of chloroform, was laid over the nose and mouth, and in less than a minute complete unconsciousness was the result. The operation was then proceeded with, but, owing to a considerable venous hemorrhage, the trachea, although readily exposed, was not opened for half an hour. Four of its rings were then divided, when, upon the first expiration, attended with coughing, a large-sized grain of maize, which already exhibited signs of germination, was forcibly ejected. During all this time the child was more or less under the influence of chloroform, the application being renewed whenever there was any return of consciousness. Speedy recovery was the consequence.

On the 24th of September, 1849, I performed tracheotomy upon a negress, six years of age, while she was under the influence of chloroform. This patient, who was kindly sent to me by my friend Dr. Pendleton, near Louisville, had a week previously inhaled a brass button. The accident was followed by symptoms of suffocation and loss of voice, the latter of which continued until the ejection of the foreign substance, in a violent effort at vomiting soon after the operation. The wound healed by the first intention, and the girl recovered without an untoward symptom. Since that time, I have employed chloroform, with great advantage, in two other cases of a similar kind.

One of my former pupils, Dr. Trabue, of Glasgow, Kentucky, has used chloroform twice in this operation within the last eighteen months, and on both occasions with the most gratifying effect. Dr. William H. Van Buren, of New York, informs me that he has opened the trachea twice while the patient was under the influence of this agent. Professor Eve,[1] of Nashville, last summer performed

[1] Nashville Journal of Medicine and Surgery, vol. iii. p. 131, 1853.

a similar operation upon a boy, five years old, who had inhaled a shingle-nail, nearly an inch and a half in length; it had lodged in the left bronchial tube, from which it was adroitly extracted with the forceps. The child, owing to the occurrence of bleeding and vomiting, was kept on the table for more than half an hour; and although it is not stated, yet I infer that the influence of the chloroform was maintained during nearly the whole of this period. Dr. Eve ascribes the success of the operation mainly to the agency of this article, the administration of which was admirably regulated to the requisite extent without, at any time, producing stertorous breathing. In a case operated upon in 1852, by Dr. G. R. Morehouse,[1] of Philadelphia, that gentleman employed etherization, with much advantage, to allay the violent convulsive struggles of the patient, a girl ten years of age.

In a case of tracheotomy by Mr. Rayner,[2] of England, in a girl aged seven years, chloroform had the effect of perfectly quieting the windpipe and adjacent parts. The foreign body, a sheep's tooth, was forcibly ejected through the wound, in a violent fit of coughing, a few minutes after the operation was completed. This case occurred early in February, 1848, and was probably the first of the kind in Great Britain in which anæsthesia was employed.

In the case reported by Mr. David Johnston,[3] of Montrose, England, of a lad, fifteen years old, who had inhaled a piece of the shell of a hazel-nut, chloroform was administered after the operation, and the effect was that the windpipe, previously exquisitely irritable, and intolerant of manipulative interference, became immediately so blunted as to admit of the most thorough and patient exploration with the forceps.

In a communication recently received from Dr. J. Mason Warren, that gentleman informs me that he has lately employed etherization with the happiest results in two cases of laryngotomy. In one of these cases, it so completely obtunded the sensibility of the trachea as to render it perfectly tolerant of the presence and movements of the forceps, which were repeatedly introduced, being retained each time from half a minute to a minute.

[1] Philadelphia Medical Examiner, April, 1852.

[2] London Lancet, vol. i. p. 231, 1848.

[3] *Ibid.* for 1851, vol. ii. p. 600.

The preceding cases, embracing nearly all of which I have any knowledge, are, I trust, sufficient to show the value of anæsthetic agents in this particular department of surgery. They tend to establish the important fact that this class of remedies may be most advantageously employed, not only during these operations, with a view of preventing any resistance on the part of the patient, but also during the extraction of the foreign body, for the purpose of controlling cough and spasm of the windpipe, which are frequently so violent and embarrassing, under these circumstances, as to compel us, as it were, to fold our arms, and become idle spectators of what is going on around us. The statement here made derives additional confirmation from some experiments, which I performed upon the mucous membrane of the air-passages of dogs, under the influence of chloroform, and which are briefly mentioned in the first section of the present chapter.

SECTION VIII.

EXTRACTION OF THE FOREIGN BODY.

It has been already seen that, very frequently, the moment the trachea has been freely opened the foreign body is ejected either at the artificial aperture, or through the mouth. Cases, however, occasionally occur in which, in consequence of its situation or the manner in which it is impacted, it manifests no such tendency, but, on the contrary, is retained for an indefinite period; thus either endangering the patient's life by suffocation, or, if he be so fortunate as to escape this, inducing serious if not irreparable mischief in the lungs. It is for the purpose of avoiding these unhappy effects that surgeons, under such circumstances, generally attempt to seize and extract the extraneous substance by means of particular instruments, of which the principal are probes and forceps of various forms and sizes. It is impossible to say with whom this practice originated, though there is reason to believe that it was in use at a comparatively early period of the profession.

The following cases, while they illustrate the ingenuity of the different operators in whose practice they occurred, will serve to place this subject in its true light by showing what contrivances

may be necessary, in order to extract foreign substances from various parts of the air-passages.

One of the first cases in which an attempt was made, in this country, to extract a foreign body from the windpipe, occurred, about thirty years ago, in the western part of Pennsylvania, and is briefly alluded to by Dr. Jameson, of Baltimore, in the seventh volume of the *American Medical Recorder*.[1] The bean had descended as low down as the bifurcation of the trachea, and was removed with complete success by means of a pair of long wire forceps.

In the same volume of the same periodical, Dr. Joseph Palmer gives the particulars of the case of a child of twenty months, from whose trachea he removed, two hours after the accident, a large kidney bean by means of a flat probe. The foreign body was seen to rise and fall during respiration. The wound in the tube was at least one inch in length. The patient recovered.

In the case of a child, aged four years, the particulars of which are related by Dr. Charles Hall,[2] of Burlington, Vermont, the substance, a pipe-stem, one inch and three-quarters long, was seized and extracted with a probe. The instrument was passed in the direction of the right bronchial tube, and, after some minutes, its extremity happened to enter the canal of the stem, which was thus drawn up and removed.

Sir Charles Bell[3] met with an instance in a child, aged nine years, from whose trachea he removed a piece of plum-stone with a silver probe bent into a hook at the end. He thus brought the foreign body to the wound, when it was seized and withdrawn with a pair of dressing-forceps. Laryngotomy had been performed, but he afterwards enlarged the incision by cutting downwards.

The case of Mr. Liston,[4] in which this distinguished surgeon extracted a piece of bone from the right bronchial tube, is almost too well known to require mention in this place. It is one of the most remarkable examples of skill and good luck to be found on record. Six months and a half had elapsed before tracheotomy was performed. The foreign substance, a piece of bone, was situated in the right bronchial tube, and was removed with a pair of forceps, the intro-

[1] A Second Case of Bronchotomy, p. 53, January, 1824.

[2] Am. Journ. Med. Sciences, N. S., vol. ix. p. 357.

[3] Institutes of Surgery, vol. ii. p. 280, London, 1838.

[4] Dr. James Duncan, London Lancet, vol. ii. p. 419, 1833–34.

duction of which excited fits of coughing, with heaving of the chest and lividity of the countenance. No untoward symptoms followed, and the patient left the hospital in less than ten days after the operation.

A case somewhat similar to the above occurred to Mr. Dickin, of Middleton, England, and is mentioned in the fourth edition of Mr. Liston's *Practical Surgery*. The patient, a boy, eight years old, allowed a button to slip into his windpipe while at play, and was instantly attacked with extreme difficulty of breathing, threatening suffocation. The larynx and trachea were opened to the extent of an inch on the tenth day, after the more ordinary means had failed to afford relief. A pair of long slender forceps, slightly bent, being introduced, the foreign body was struck, and, on a second attempt, seized and extracted.

Professor Eve[1] recently met with the case of a child, five years old, from whose left bronchial tube he extracted, by means of a pair of forceps, a fourpenny nail, nearly an inch and a half in length. Emetics and inversion of the body had been previously tried without benefit. Tracheotomy was performed three weeks after the accident, the little patient being under the influence of chloroform, to which, the reporter thinks, much of the success of the operation was attributable.

Mr. Edwin Casson,[2] of England, reports a case of tracheotomy in a child, six years of age, from whose right bronchial tube a stone was removed by means of a pair of slightly curved polypus forceps. No respiration was distinguishable in the corresponding lung previous to the operation.

The following case is mentioned by Professor May,[3] of Washington City. The patient, a child about five years of age, had inhaled a grain of corn, which, after the trachea had been divided to the extent of three or four rings, could be plainly seen to approach the opening at every expiration, descending again during inspiration, thus playing continually up and down the tube. Several attempts were made to seize it with the forceps as it flew upwards, and also to dislodge it by dilating the wound; but, failing in this, Dr. May introduced a curved probe, with which he suddenly caught and extracted it. In another case, related by the

[1] Nashville Journ. Med. and Surg. vol. iii. p. 131, 1853.

[2] Provincial Medical and Surgical Journal for September, 1843.

[3] Amer. Journ. Med. Sciences, New Series, vol. xxiii. p. 414.

same gentleman, of a child five years of age, laryngotomy was performed, and the extraneous substance, a grain of coffee, pushed into the fauces, by means of a probe, curved at the end, and wrapped with a piece of linen. Dr. May[1] was not certain whether, in this instance, the substance was lodged in one of the laryngeal pouches, or about the rima of the glottis. It was afterwards discharged by the bowels.

Sometimes a scoop is used for effecting dislodgement and extrusion of the foreign body, especially when it is situated in the larynx. In an instance of this kind, I employed with great advantage a small mop, made of a piece of soft sponge attached to the end of a rod of whalebone. In a case of laryngotomy, performed for the removal of a cockle-bur from the ventricle of Morgagni, Professor Mussey,[2] of Cincinnati, effected dislodgement with his finger, after having in vain endeavored to accomplish it with a pair of forceps and a silver director, bent into a hook at the extremity. His incision extended from near the upper border of the thyroid cartilage to the trachea. The patient was a lad, aged fifteen years, and the bur, which was half an inch long, and very rough, seemed to have been completely impacted, as it was removed with much difficulty. A considerable stream of blood followed for a few moments, owing to the lesion of the mucous membrane of the parts in contact with the foreign substance.

In the following case, related by Professor Dugas,[3] of Georgia, the foreign body, impacted in the rima of the glottis, was successfully removed with the forceps, after several fruitless attempts had been made to dislodge it with emetics.

A negro lad, twelve years of age, having a cockle-bur in his mouth, by a sudden inspiration drew it into his larynx. He immediately experienced some difficulty of breathing, attended with frequent coughing. To relieve these symptoms an emetic was administered, but without any benefit. This state of things had continued for several days, when the case fell into the hands of Dr. Dugas. The voice, at this time, was extinct, and the boy spoke in a whisper; he breathed and coughed as though he was affected with œdema of the glottis; on walking briskly, his respiration was much embarrassed, and the thyroid cartilage was pointed to as the seat of sore-

[1] *Op. cit.* vol. xxiii. p. 413.

[2] Transactions of the Amer. Med Association, vol. iii. p. 362.

[3] Southern Medical and Surgical Journal, Aug. 1853.

ness. The pulmonary sounds were natural, but a whizzing noise was pereeived on placing the stethoscope upon the larynx. The finger, on being earried down below the epiglottis, felt the bur whenever the larynx was elevated by an attempt at deglutition. A pair of œsophagus foreeps being at hand, repeated efforts were made, but in vain, to seize the forcign body, and extraet it. The continued movemcnts of the larynx presented an insuperable difficulty, and the patient beeame so mueh exhausted that the operator was eompelled to desist. The boy was now allowed to rest, and a dose of ipecacuanha was administered, in the hope that the bur might be dislodged in the effort to vomit; but this also failed, as the emetic had done a few days before.

On the following day, Dr. Dugas, provided with a pair of slender curved polypus foreeps, foreibly drew up the epiglottis with the left index finger, whieh he at the same time brought into eontaet with the bur. Steadying the larynx carefully in this manner, the instrument was earried along the finger, thus placed, and the foreign body effeetually seized and extraeted, after a single unsueeessful effort.

The great novelty in this ease eonsists in the manner in which Dr. Dugas steadied the larynx, the eonstant movements of whieh had previously rendered all attempts at extraetion perfeetly nugatory. He thinks that the operation may be more easily performed in ehildren than in adults. No one aequainted with the effeets of chloroform could doubt that its use would be of immense value in sueh a case, as it would tend to quiet the larynx, and afford the surgeon a better opportunity of seizing the foreign substanee.

When the foreign substance lies partly within the glottis, and partly within the fauees, or at the root of the tongue, it may sometimes be withdrawn by a very simple proeess, as in the case mentioned by Dupuytren. A woman, upwards of forty-five years of age, having swallowed a fish-bone, applied a week afterwards at the Hôtel-Dieu for relief on aeeount of violent pain at the top of the larynx, under which she had labored ever sinee the aecident, and which had latterly mueh inereased. The mouth being widely opened, Dupuytren introdueed his finger as far as the epiglottis, at the base of whieh he deteeted a substance projeeting like a pin's head. Maintaining his finger on the foreign body, he earried down, by its guidance, a pair of dressing-foreeps, with whieh he seized the fish-bone, and gently extracted it. The bone was about one inch

and a quarter in length. The operation was attended with little pain and no hemorrhage, and the woman promptly recovered.[1]

Dr. J. Mason Warren,[2] being called to a young woman who had been so unfortunate as to get a pin into the larynx, adopted the following expedient for its removal. Guided by a pricking sensation, which the patient experienced on the left side of the thyroid cartilage, he had the head held back so as to bring the mouth as nearly as possible into a line with the œsophagus. The forefinger of the right hand was then carried down the throat, and from thence on over the epiglottis and top of the larynx. Nothing unnatural, however, was discovered, but the woman exclaimed that the pin had been moved. In a second trial, made immediately after, the right index finger was placed on the neck, at the spot where the pricking pain was felt, while the left index finger was carried into the fauces, so as to oppose it to the other. It was now found that the larynx intervened, and, on pressing them together, she immediately cried out that the pin had moved; which proved to be the fact, as the cough, which had continued almost without interruption ever since the accident, a week ago, was immediately relieved, and did not afterwards return.

Dr. John L. Atlee,[3] of Pennsylvania, met with an instance, altogether, I believe, unique in its character, in which he succeeded in relieving his patient by rupturing an abscess in the left lung, in which the foreign body was contained. While searching for the substance—a piece of hickory-nut kernel, inhaled about two months and a half previously—his probe came accidentally in contact with the abscess, the contents of which were immediately coughed up along with the extraneous body. The patient, a boy, aged five years, rapidly and completely recovered. The particulars of this case are given at length in the chapter on tracheotomy.

All attempts at searching for the foreign body, whether it is lodged in the larynx, the trachea, or bronchial tubes, are attended with irritation of the mucous membrane, leading to violent convulsive coughing and heaving of the chest, with a sense of impending suffocation. The patient, whatever may be his age, or his courage, is, consequently, usually very restive, opposing every possible obstacle to the efforts of the surgeon, however gently

[1] Johnson's Medico-Chir. Review, New Series, vol. xiii. p. 465. New York, 1830.

[2] Boston Med. and Surg. Journ. vol. xxxvii. p. 394, 1847.

[3] MS. Letter to the author.

and cautiously conducted. No amount of resolution which he can command is sufficient to control his feelings, and enable him to co-operate with the professional attendant. All appeals to his reason, his judgment, and his fears, are alike unavailing. Under such circumstances, lucky is the surgeon who, by stratagem, adroitness, patience, and perseverance, can seize the foreign body and extract it, amidst the struggles of the poor sufferer, and the cries of his friends.

The time during which these efforts at extraction should be persisted in must necessarily depend upon circumstances. In general, they should not last longer than a few seconds; nor should they be too frequently repeated, lest they induce suffocation, or, if the patient survive, inflammation and other ill consequences.

All efforts at extraction should be conducted with the utmost gentleness and care; otherwise the foreign substance may be pushed farther into the windpipe, or become more firmly impacted in its situation. If forceps be employed, they should be used, at first, as a probe, and, as soon as the extraneous body has been found, the blades should be expanded over it, just as in the operation of lithotomy they are expanded over the stone in the bladder. Occasionally it has happened that the foreign substance has been forced, during expiration or coughing, into the jaws of the forceps, held as a sort of trap, ready to receive it the moment it should leave its place of concealment. Mr. Liston, in his celebrated case, at once seized the extraneous substance, a piece of bone, lodged in the right bronchial tube; but, in his attempt to extract it, it escaped from the grasp of the forceps; he immediately caught it again, and then brought it out without much difficulty. Many years ago, an instance occurred at Monston, Vermont, in which a child inhaled a bean; Dr. Stone, a neighboring physician, being called in, at once performed tracheotomy; the bean, however, did not appear, and he was therefore obliged, as he had no proper instrument at hand, to wait until an ingenious mechanic constructed a pair of long, slender forceps, of soft iron, which he bent and shaped until he was enabled to reach and fairly grasp the foreign substance.

Although all protracted efforts at searching for foreign bodies in the windpipe cannot be too much deprecated, as likely to be productive of serious consequences, yet an instance occasionally occurs where the contact of instruments seems to be perfectly harmless, and

to defy, as it were, the calculations of the surgeon. The truth of this remark is strikingly corroborated by the case of a little child, three years old, observed by Dr. Calvin Jewett,[1] of St. Johnsburg, Vermont. Tracheotomy was performed on the eleventh day, and every effort made, for nearly two hours, but without success, to extract the foreign substance. Various instruments, such as forceps and probes, were repeatedly introduced through the artificial opening, into the trachea and right bronchial tube, touching the nail again and again, and yet no evil result followed these protracted manipulations. The child soon recovered from the effects of the operation, and the nail was afterwards expelled spontaneously on the thirty-third day.[2]

To afford full play to the instrument, it is an essential prerequisite that there should be an adequate opening in the windpipe. When the artificial aperture is disproportionably small, the operator may even find much difficulty in discovering it; or, instead of

[1] Boston Med. and Surg. Journ. vol. xvi. p. 88, 1837.

[2] My friend, Dr. John L. Atlee, of Pennsylvania, supposes that it is possible, in most cases, to establish a certain amount of tolerance in the mucous membrane of the trachea and bronchial tubes for almost any instruments that may be required for the removal of foreign bodies. To accomplish this he declares that it is only necessary to retain them in these passages until the first effects induced by their presence have subsided. This usually happens in a few seconds, when the operator will be enabled to renew his efforts more safely and efficiently. Alluding to an interesting case, the details of which will be found in another part of this treatise, he remarks that "the point of greatest practical importance in it is the fact that the trachea and bronchia will tolerate the presence of a foreign body, as a probe or forceps, if we persist in retaining it there until the first effects have subsided. Hitherto I made it a rule to withdraw the instrument whenever cough came on, supposing that this would continue as long as the probe remained, and as, in this way, I could make no satisfactory search, I had to relinquish the attempt. In our standard works on surgery, ample directions are given for performing the operation of tracheotomy; but the fact here stated is nowhere alluded to." "In this case," continues Dr. Atlee, "I was struck with the great sympathy existing between the lungs and the stomach. Every severe paroxysm of cough produced by the presence of the probe terminated by an effort to vomit, and immediately after this, and without having withdrawn the instrument, the lungs became tranquil, and I proceeded with the exploration. When the cough returned, I held the probe in such a position and so loosely between my fingers as to prevent any injury to the mucous membrane which might be forced against it, during the patient's exertion." MS. Letter to the Author.

The reader is requested to compare the above statements with the results of the experiments of Favier, Magendie, and Erichsen, and with what we have said on the subject of chloroform as a means of quieting the respiratory passages during our attempts at extracting foreign bodies from them.

introducing the forceps into the tube, he may pass it down in front of it into the cellular tissue of the neck, thereby endangering the parts by inducing inflammation, suppuration, and even erysipelas. Such an accident cannot be too much deprecated.

Finally, it should be remembered that the forceps in descending the trachea may slide over the foreign substance without the knowledge of the operator, as no distinct sensation will, perhaps, be imparted to his hand, especially if the body be very small, smooth, or globular; or the instrument, instead of seizing the intruder, may grasp the septum at the bifurcation of the tube, and thus lead him astray. It is only, or mainly, when the extraneous substance is rough, or angular, that he will be likely to know that he has got hold of it; hence it will be perceived how important it is that he should make himself acquainted with its nature before he attempts its extraction. Again, it should be recollected that the intruder, if lodged in the bronchial tube, may be so large as to fill completely its caliber, thereby preventing the operator from expanding the blades of the forceps sufficiently to grasp it. A bullet, firmly wedged in the tube, could hardly be seized with any instrument, however ingeniously constructed, or adroitly managed. A smooth, round pebble, bead, pea, or bean, is not, as a general rule, as easily grasped and extracted as a rough, angular body.

When the foreign substance is not ejected soon after the trachea has been incised, Dr. H. G. Jameson,[1] of Baltimore, proposed, in 1823, to introduce an eyed probe, armed with a piece of sponge, to produce temporary occlusion of the tube. The effect of this occlusion will be, as he supposes, to cause a violent expiratory effort, during which the intruder would probably be forcibly expelled. In confirmation of the propriety of this practice, he states that Dr. Harper, of Baltimore, had adopted it successfully in two instances. The plan, I must confess, strikes me very favorably, and I shall certainly employ it on the first occasion that may present itself. I would suggest, however, as a most important preliminary step, that the patient should take a deep inspiration, so as to inflate the lungs to their utmost, and thereby increase their expulsive power upon the removal of the sponge. The air thus tightly pent up could hardly fail to drive the foreign body, unless this were very large or heavy, forcibly from the windpipe.

[1] American Medical Recorder, vol. v. p. 676.

The same surgeon employed, in one case, the singular and, as it appears to me, very improper expedient of admitting blood into the trachea through the wound, in the hope that by coagulating round the foreign body, the latter might be more easily expelled by the powers of the lungs. To such a practice I should most decidedly object; because it could hardly fail, under any circumstances, to be dangerous.

Two instances are mentioned in the table in which the expulsion of the foreign body was promoted by titillating the mucous membrane of the trachea and bronchial tubes with a probe. The first case occurred in 1828, in the practice of Mons. Mazier,[1] a French surgeon. A girl, aged four years, had inhaled a bean, for the removal of which the trachea was opened in the usual manner. Finding that the foreign body would not make its appearance, he provoked coughing by tickling the lining membrane with a probe, when, after having repeated the process several times, it was forced into the artificial aperture, from which it was easily extracted with the forceps. In the other case, the operator, Mons. Jobert,[2] resorted to the same means for the purpose of promoting the expulsion of a prune-stone, inhaled seven days previously by a female, aged twenty-six years. A canula was introduced into the wound immediately after the tube was opened, for the purpose, apparently, of preventing hemorrhage. The morning after the operation, a probe was passed down into the right bronchial tube, the supposed site of the extraneous body, to provoke coughing. The process was repeated once every twenty-four hours until the tenth day, when the prune-stone was fortunately ejected through the wound.

Not having any experience with this mode of treatment, it hardly becomes me to express any opinion respecting its merits. I should certainly, however, be inclined to give it a trial where the foreign substance is indisposed to move about, or where it resists the ordinary expiratory efforts. It is evident, at all events, that no detriment can result from its employment provided there is a free opening in the trachea, admitting of the prompt expulsion of the extraneous body in case it ascends the trachea on withdrawing the instrument.

I must not forget, in connection with this subject, to allude to a

[1] Annal. de la Méd. et Physiol. Dec. 1828.

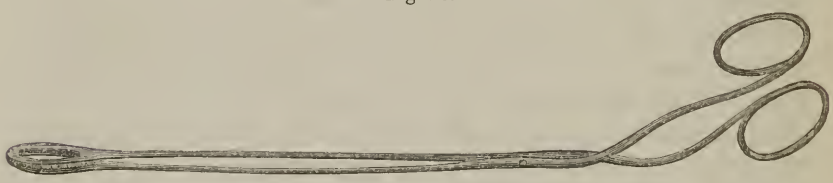
[2] L'Union Médicale, No. 68, 1851.

novel suggestion of Dr. Eve, for promoting the extrusion of the foreign substance. In speaking of the case of a child, who had inhaled a nail, and upon whom it had been agreed to perform the operation of tracheotomy, he says:[1] "It is proper to state that the possibility of acting upon it—that is, the nail—through the agency of magnetism was duly considered, and experiments performed with this object, but leading to no available practical results. The forceps used in the case were magnetized, but exercised no perceptible influence in the extraction of the foreign body." Whether this proposal originated with Dr. Eve, I am not able to say; but, however this may be, we may well doubt its efficacy.

Various *instruments*, as has been already seen, have been contrived for the purpose of effecting the dislodgement and removal of foreign bodies. Of these, a few of the most eligible and important require particular notice.

1. Figure 20 represents a pair of forceps, constructed for me by Mr. Erringer, an able cutler of this city, after a model which I gave

Fig. 20.



him many years ago. They are composed of silver, and are a little upwards of eight inches in length. The handle is considerably curved on the flat, and has two large rings for the thumb and finger. The blades, which are rounded and very slender, are five inches long, and terminate each in a fenestrated extremity, nine lines in length by three lines in width, the outer surface being smooth and convex, the inner flat and slightly serrated. In consequence of the peculiar arrangement of the handle of the forceps, the blades, when shut, partially overlap each other, and thus occupy the smallest possible space in the trachea. The whole weight of the instrument is a little over five drachms. The great advantages of this instrument are, first, that, being very long and slender, it may be used with

[1] Nashville Journal of Medicine and Surgery, vol. v. p. 130, Sept. 1853.

equal facility as a probe and an extractor; secondly, that, being composed of silver, it may be bent at any point and in any direction, according to the pleasure of the operator; and thirdly, that it is so exceedingly delicate that it cannot possibly seriously impede the passage of the air, during the attempts which are necessary to explore the windpipe for ascertaining the precise situation of the foreign substance.

2. Mr. Oswald Dickin,[1] of England, has described a pair of forceps, which he employed with great success in extracting a bell-button from the right bronchial tube of a boy, eight years old. Its form and construction will be readily understood by the annexed sketch (Fig. 21), in which the foreign substance is seen in the jaws of the instrument.

3. Mr. John E. Erichsen,[2] of London, recommends a pair of cross-action forceps, the blades of which terminate in branches two inches and a half in length, and slightly bowed at the extremities; within the bowed part is inserted a piece of delicate but strong

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

net, for the purpose of entrapping the foreign substance as it is forced upwards by the propulsive efforts of the lungs. The instru-

[1] Liston's Practical Surgery, 4th ed. London, 1846.

[2] London Medical Gazette, vol. ii. p. 559, 1843.

ment, which opens to the extent of three-quarters of an inch, should be introduced edgewise in a direction corresponding to the longitudinal diameter of the tracheal wound, after which, the patient being turned upon his face, the blades may be expanded transversely. The engravings (Figs. 22, 23, 24) will afford a much better idea of this instrument than any description, however elaborate.

4. The late Mr. Liston[1] has delineated two forceps (Figs. 25, 26), which he employed, very effectually, in extracting a piece of bone

Fig. 25.

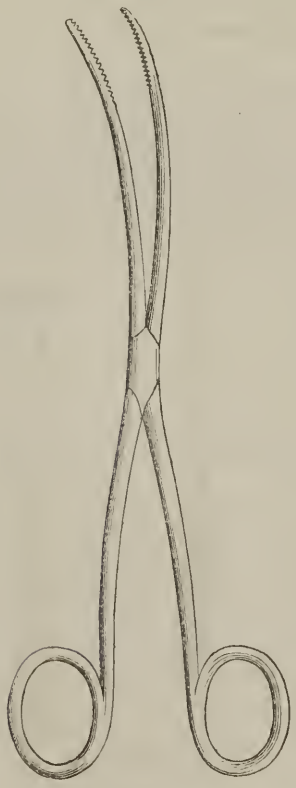
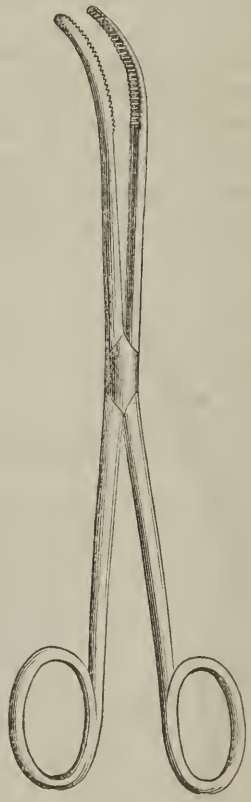


Fig. 26.



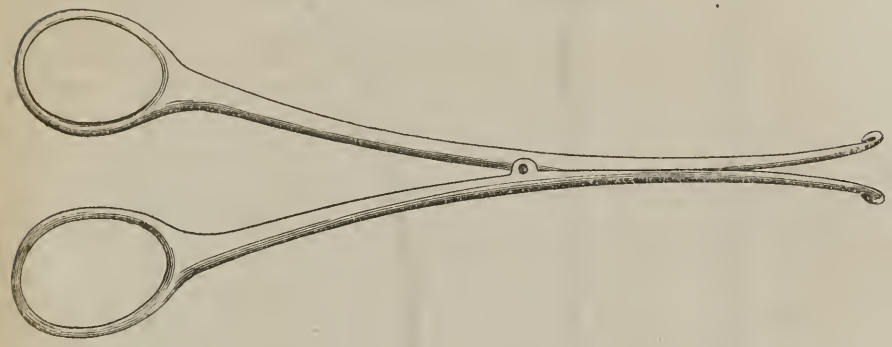
from the right bronchial tube of a female, aged thirty-seven, where it had been impacted for nearly six months. They are each seven inches in length, very slender, and composed of steel; the blades

[1] Practical Surgery, 4th ed.

being slightly curved, and arranged differently in each instrument.

5. The forceps represented in the adjoining sketch (Fig. 27), were invented by Mons. Trousseau, of Paris, and are usually known by

Fig. 27.



his name. They are intended for holding apart the edges of the wound in the trachea, while the surgeon attempts to extract the foreign substance with other and more suitable instruments, introduced between their expanded blades.

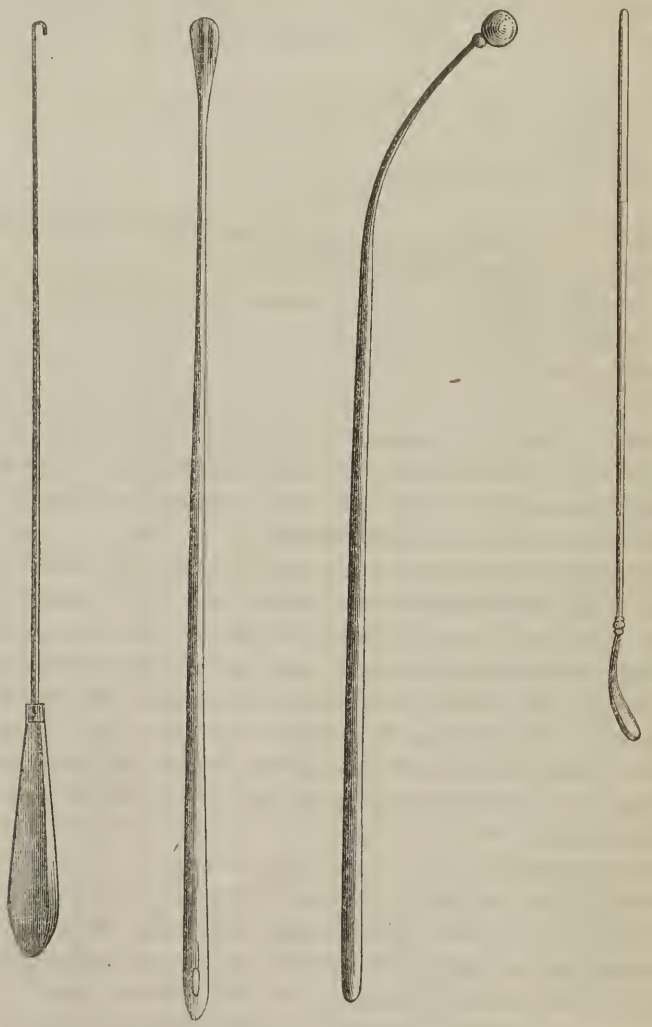
6. Figure 28 represents a long slender hook, composed of silver, and well adapted for extracting foreign bodies, as beans, grains of corn, coins, prune-stones, pebbles, and bits of bone, situated in the inferior portion of the trachea, or in one of the bronchial tubes. The curved part of the instrument is very short and blunt at the extremity. The fact that it is furnished with a handle gives it a great advantage over a common probe, bent at the end, inasmuch as it can be moved about with much greater certainty and precision in the windpipe.

7. For exploring the air-passages, or dislodging foreign bodies from the larynx, especially the ventricles of Morgagni, hardly anything better could be imagined than the probe sketched in the accompanying engraving (Fig. 29). It is about nine inches in length, bulbous at the extremity, and composed of silver, or, what will answer equally well, of brass. Being flexible, any curve may be imparted to it that may be desirable.

8. The instrument (Fig. 30) is merely a whalebone mop, that is, a piece of pretty firm whalebone, bent to an angle of about forty-five degrees, and guarded at its extremity with a small piece of

very soft sponge. It is admirably adapted for removing extraneous matter from the larynx, and should find a place in every surgeon's drawer.

Fig. 28. Fig. 29. Fig. 30. Fig. 31.



9. Another instrument (Fig. 31) which the operator should have at hand, especially when the extraneous body is impacted in one of the ventricles of the larynx, is a flexible grooved director, such as is usually found in our pocket cases. The scoop-shaped ex-

tremity of this instrument may be used with great advantage, under such circumstances, particularly if it be slightly bent, to admit of more easy introduction into the pouch-like depression alluded to. The blunt hook, sketched in Fig. 28, is also well adapted to the same end.

SECTION IX.

DIFFICULTIES OF THE OPERATION.

Various circumstances may arise, during these operations, calculated to embarrass the surgeon and retard the extraction of the foreign body. These circumstances are sufficiently frequent and important to entitle them to separate consideration.

Firstly. Much of the perplexity formerly attendant upon bronchotomy grew out of the difficulty of *holding* the patient during the operation. Generally it required a number of assistants to secure him, and even then the surgeon was often excessively annoyed and fretted, in consequence of the resistance opposed to his efforts. It was, indeed, almost as much as he and half a dozen persons could do to keep him sufficiently quiet till the windpipe was opened. Fortunately, this annoyance is now done away with since the discovery of chloroform, which, as before stated, has already been used in a sufficient number of cases to demonstrate the propriety and safety of its exhibition in all, or nearly all, instances of this accident. No difficulty is now experienced in managing a patient, however intractable; by means of this agent, a few minutes serve to render him perfectly docile, while the surgeon is enabled to perform his task with all the care and deliberation required in so delicate a procedure.

Secondly. Difficulty may arise from unusual thickness and *shortness* of the neck. This will be most likely to happen in very young children, in whom the quantity of adipose matter is sometimes so great that the windpipe is literally buried at a distance of several inches, and therefore comparatively inaccessible. Mr. Porter,[1] of Dublin, states that he knew an instance in which a sur-

[1] Observations on the Surgical Pathology of the Larynx and Trachea, p. 266. London, 1837.

geon, in attempting to tracheotomize a child, was absolutely obliged to abandon the operation, as he could not find the windpipe! Unfortunately, this gentleman does not inform us whether the failure, in this case, was owing to the timidity of the surgeon or to the circumstance above referred to. Judging from his note of exclamation, it was probably the former. It is proper to add that the thickness of the neck is sometimes greatly increased by emphysema, consequent upon the accident, and by the presence of œdema of the glottis, as in the case mentioned by Mr. McNamara,[1] of Dublin, which, however, was not one of foreign body in the air-passages.

When extraordinary depth of the trachea, from whatever cause, is conjoined with unusual shortness of the neck, or when it exists by itself, the proper mode of proceeding is to make a free external incision, commencing above the hyoid bone, and terminating at the sternum.

Thirdly. Embarrassment may arise, as was previously stated, from the *vessels* of the neck. These vessels, and the proper method of avoiding them, will be described in another article, and it is, therefore, not necessary to say anything further respecting them here.

Fourthly. A very disagreeable occurrence, and one which is rarely entirely absent in any case, is the want of steadiness on the part of the windpipe, caused by the *movements* of the tube consequent upon the cough and struggles of the patient. Every surgeon that has ever performed tracheotomy must have witnessed this occurrence, and been more or less annoyed by it. The best way to prevent it is to administer chloroform. Should it take place despite this remedy, or, should the remedy be inadmissible, the only thing to be done is to thrust a tenaculum into the tube, thereby steadying it until the requisite opening has been effected, when it should be immediately withdrawn. Care, of course, should be taken not to transfix the tube, which, besides being unnecessary, might induce severe irritation, if not fatal inflammation.

Fifthly. There may be *ossification* of the rings of the trachea and of the cartilages of the larynx, rendering it difficult to effect the necessary opening. Such an affection is, of course, not to be looked for in young subjects, while it is not uncommon in persons of advanced age. Ossification of the trachea is most frequent after

[1] London Lancet, 1830–31, vol. i. p. 269.

the sixtieth year, but an instance occasionally occurs much earlier, as in the man operated upon by Mr. McNamara,[1] who was only forty-seven, and yet the rings of the tube were so hard that this surgeon was unable to divide them with the knife. In a case under the care of the late Mr. Liston, the same circumstance took place. Ossification of the cartilages of the larynx is also most common in advanced life, and is much more frequent than that of the trachea. The piece most liable to this degeneration is the thyroid, which is often completely transformed into a hard, rigid shell, emitting, when struck, a sound like a dice-box.

When the windpipe is in the condition here specified, an opening should be made through the fibrous membrane of the trachea, between two of its rings, large enough to admit the point of one of the blades of a pair of scissors, with which the incision may afterwards be enlarged to any extent that may be deemed necessary. When the ossification is very great, a pair of bone-forceps may be required, as in Mr. Liston's case, above referred to. The same instrument must be used in ossification of the larynx.

Sixthly. Embarrassment, especially in the hands of an inexperienced operator, may proceed from the presence of the *muscle of the thyroid body.* This muscle, described by Sœmmering under the name of the elevator muscle of this gland, probably exists much more frequently than is generally supposed. Dr. Godman, in his *Anatomical Investigations*, published at Philadelphia, in 1824, states that it was found not less than six times, during a single session, in his dissecting-rooms. In four of the cases, the muscle was on the left side, arising from the upper border of the thyroid body, and ascending to be inserted into the hyoid bone, midway between its base and appendix. In the other two instances, the muscle originated from the centre of both lobes, and was inserted directly into the centre of the base of the hyoid bone. Godman's account of this muscle is accompanied by a very graphic drawing.

It is not improbable that this muscle is occasionally mistaken for the *pyramid of Lalouette*, a process of the thyroid body, extending upwards towards the hyoid bone. Generally, this process lies somewhat to the left side, but sometimes it ascends directly along the middle line, and when this is the case, it would necessarily be

[1] London Lancet, vol. i. p. 269. 1830–31.

in the way of the knife in the operation of laryngotomy. As its name implies, it is of a conical shape, being larger below than above, though occasionally the reverse is found to be the fact. It is of a fibrous structure, but often presents a reddish, striated appearance, not unlike a small muscle; whence the liability to the mistake above alluded to.

The *thyroid body* itself may become a cause of embarrassment in this operation. This circumstance will, of course, be most liable to happen when there is some abnormal development of this organ, as in goitrous disease, whether it affect its isthmus alone, or both the isthmus and the lateral lobes. It is well known that the isthmus is sometimes remarkably thick, while at other times it is so broad as to descend almost to the top of the sternum. In very young children, it occasionally meets the thymus gland, the two together forming a complete covering for the anterior portion of the trachea.

The hypertrophy sometimes mainly affects the lateral lobes of the thyroid gland. When this is the case, they may extend unusually far forward, lying directly in front of the windpipe, and thus seriously complicating the operation necessary for opening the tube. The proper way to meet such a contingency is to push the parts out of the reach of the knife. In a case mentioned by Mons. Jobert,[1] the enlarged gland was held up by a stout, well-waxed ligature passed through its substance, and fastened to the patient's cap. Such a procedure may become highly necessary where the organ is so voluminous as to encroach seriously upon the artificial opening.

The following case forcibly illustrates the obstacles and inconveniences which an enlarged thyroid body may oppose to the successful performance of the operation of tracheotomy.

A little girl, aged five years, who had always enjoyed good health, on the 31st of March, 1853, inadvertently inhaled a bean with which she had just been playing. She was instantly seized with a paroxysm of suffocation, so violent as to induce her mother to believe that it would kill her. The danger, however, soon disappeared, and at five o'clock in the evening the child was brought to Mons. V. Fleury,[2] Surgeon to the Hôtel-Dieu at Clermont. He found the face and eyelids somewhat tumid, evidently from the

[1] L'Union Médicale, No. 68. 1851.

[2] Gazette des Hôpitaux Civils et Militaires, Mardi, 14 Février, 1854.

struggles made by the patient to get rid of the foreign body. The respiration was calm, and there was merely an expression of fatigue. Auscultation of the larynx, trachea, and bronchial tubes afforded no positive evidence of the nature of the accident. The child remained comfortable until the following morning, when she was attacked with another fit of suffocation, less violent, however, than the first. Tracheotomy was attempted at seven o'clock, the swelling of the face having now reached the neck, and become so extensive as to mask the prominence of the larynx and the thyroid body, the latter of which was of considerable bulk. A large vein, a branch of the external jugular, passed obliquely across the inferior portion of the neck, and was divided between two ligatures, applied to prevent hemorrhage. The incision in the skin extended from the lower margin of the larynx to the fourchette of the sternum. The struggles of the child, which strongly flexed the head, rendered the operation very difficult and tedious. Finding that the thyroid body was unusually large, Mons. Fleury was compelled to confine himself to the inferior portion of the tube, and, in trying to separate the muscles which covered it, he unfortunately opened a voluminous vein. At this moment, a loud hissing noise was heard, inducing the belief on the part of the assistants that it proceeded from the escape of air from the trachea. The excessive pallor of the child, however, and the immediate occurrence of syncope, left no doubt in the mind of the operator of the entrance of air into the heart. The case, in fact, appeared to be desperate; for it was evident that the debility and unconsciousness could not be due to the loss of blood. Grasping the vein with the left thumb and forefinger, Mons. Fleury compressed the child's chest with the right hand, to favor the movements of artificial respiration. Air-bubbles escaped from the wound, and in a short time the little patient recovered her consciousness. A ligature being applied to the vein, the operation was suspended until four o'clock in the afternoon. The apprehension of wounding another vein induced Mons. Fleury to keep nearer to the larynx, where, however, new difficulties awaited him. The thyroid body covered the trachea in the greater portion of its extent, notwithstanding which he would have opened the tube had not the escape of blood, which ran from the wound in a full stream, been so copious as to induce the belief that the child might perish from the ingress of blood into the bronchial canals. The wound, as in the morning, was, therefore, stuffed with

charpie, which arrested the bleeding, and the child was sent home. In the evening, a most violent paroxysm of suffocation came on, threatening instant dissolution. On the 2d of April, the child was found to be much exhausted; the pulse was small and extremely frequent; the breathing was difficult; the face was livid, and a coarse mucous râle was heard during each inspiration. These symptoms continued until the morning of the 4th of the month, when, in a fit of suffocation, the little patient expired.

On dissection, it was ascertained that the thyroid body had been divided in its whole extent, a distance of about two inches. An opening being made into the trachea, which formed the bottom of the wound, the bean, situated at the origin of the bronchial tubes, and very much swollen, was readily extracted with a pair of polypus-forceps.

It is hardly possible to conceive of an operation more bunglingly performed than the above. Had Mons. Fleury given his little patient chloroform, and taken care that her head was properly held, the probability is that he would have experienced little or no difficulty in exposing and piercing the trachea, notwithstanding the existence of the anomalous vein in front of the neck and the unusual size of the thyroid body. The former might very easily have been held out of the way of the knife, and the latter, supposing it could not have been treated in the same manner, should have been embraced on each side of the middle line by a temporary ligature, when it might have been divided without the slightest danger of hemorrhage.

Mons. Fleury states that the number of goitrous persons is quite considerable in certain parts of the department of Puy de Dôme. At Clermont, where he resides, there are few children among the lower classes who are not affected with hypertrophy of the thyroid body. This disposition, he adds, renders all operations upon the cervical region very difficult; for, in conjunction with the enlargement in question, there is always an inordinate development of the vessels in front of the windpipe, thus complicating each case.

Seventhly. Another accident, which occasionally attends or follows these operations, especially that of tracheotomy, and which is usually more alarming than dangerous, is the occurrence of *emphysema.* This took place in one of my own patients, and was observed in several of the cases detailed in this treatise. The cause of this occurrence is, of course, the introduction of air into the subcuta-

neous cellular tissue as it escapes from the windpipe, before the edges of the wound have had time to become glazed with lymph. The emphysema varies in extent, being sometimes limited to the immediate vicinity of the artificial opening, and sometimes widely diffused, not only over the cervical region, but also over other parts of the body. It generally comes on immediately after puncturing the trachea, but, occasionally, it does not make its appearance until a short time after. The probability is that a small external opening, impeding the free egress of the air, great laxity of the cellular tissue of the neck, and violent attempts at expiration, tend to promote the occurrence. The presence of this form of emphysema is indicated by the sudden development of a soft, spongy tumor, crackling under the finger, and devoid of pain and discoloration.

In my own case, that of a boy, aged five years, the emphysema supervened within a few minutes after I had opened the trachea, and continued to spread until it had extended over the greater portion of the anterior part of the neck, when it ceased, and by next morning it had almost entirely disappeared. The opening, both externally and in the windpipe, was quite free, and the occurrence did not seem to occasion the slightest inconvenience.

In a case in the practice of Dr. J. Mason Warren,[1] the emphysema occurred during the operation, before the trachea was opened, and from quite a different cause. While this distinguished surgeon was separating the sterno-hyoid and sterno-thyroid muscles, a sudden crack was heard, as if some portion of the lung had given way. "This was immediately followed by an emphysema of the cellular membrane in the neighborhood of the wound, and a small tumor filled with air was forced out of the chest, on the left side, and in front of the trachea, at each movement of inspiration. A mitigation of the distress in breathing followed the occurrence. The tumor was now held back with a spatula, and a sharp-pointed bistoury at once plunged into the trachea." The foreign body, a bean, greatly swollen, and moving up and down the tube, was soon seized and extracted. The breathing became immediately tranquil, and the child fell into a most profound sleep. Dr. Warren, in commenting on this case, observes that it is impossible to say whether the tumor in the neck was merely a portion of inflated cellular substance, or a piece of lung. He thinks that the rupture, causing

[1] Boston Medical and Surgical Journal, vol. xxxvii. p. 391. 1848.

the emphysema, took place at the root of the lung, in one of the larger bronchial tubes, without involving the pleuritic sac. He once witnessed a similar rupture in croup, leading to emphysema of the neck and the whole side of the chest, and followed, as in the present case, by immediate relief of the embarrassment of breathing.

SECTION X.

HEMORRHAGE.

Much has been said respecting the hemorrhage attending these operations. While some contend that it is generally inconsiderable, and that it may, with proper care, be almost always avoided, others maintain that it is commonly more or less profuse, and in great measure, if not wholly, beyond the power of the surgeon to prevent; in short, that it is inevitable. By a reference to some of the cases cited in this work, it will be perceived that the loss of blood has occasionally been so great as to compel the operator to desist from his proceeding for fear of fatal consequences. In a case occurring in the practice of Dr. Henry S. Waterhouse,[1] of Franklin County, N. York, in a child, aged seventeen months, the hemorrhage is stated to have been truly appalling. The little patient was exceedingly intractable, and it was impossible to use ligatures, as the blood issued from innumerable little vessels. By the time the trachea was opened, life had apparently ceased, and it was only by the most strenuous and persevering efforts, and after having suspended the child by the heels, and compressed the abdomen so as to force the blood out of the mouth and artificial aperture, that the respiration was finally, after the expiration of an hour, re-established. The chief cause of the embarrassment in this case seems to have been the extraordinary shortness of the neck and the great depth of the windpipe. No mention is made as to the manner in which the bleeding was arrested, whether spontaneously, or by artificial means.

In a case related by Dr. Amasa Trowbridge,[2] of the State of New York, the hemorrhage was quite profuse, and was occasioned by a

[1] Phila. Journ. of the Med. and Physical Sciences, vol. vii. p. 393, 1824.

[2] Medical Repository, vol. xx. p. 79.

wound of the left subclavian vein, which passed obliquely across the trachea, and required two ligatures. The bleeding was arrested before an opening was made into the tube. Mons. Sedillot[1] refers to an instance in which the patient actually bled to death from injury inflicted upon one of the great veins of the neck in an operation of this kind. The trachea, it would seem, had been completely transfixed by the knife.

In the memorable case of Dobie, which occurred some years ago in New Hampshire, and in which tracheotomy was performed by Professor Crosby, of Dartmouth College, the parts became immediately obscured by blood, which was drawn through the wound at every inspiration, until it filled all that portion of the tube which lay between the foreign body and the artificial opening, and completely asphyxiated the patient, a man forty-four years of age. The fluid was at length cleared away with a pellet of cotton, and the foreign substance, a large piece of sponge, safely extracted; but the patient, nevertheless, expired about fifty-four hours after the operation. The reporter of the case, Dr. Peaslee,[2] does not indicate the source of the hemorrhage, which came so near destroying the patient.

Dr. S. A. Cartwright,[3] formerly of Natchez, now of New Orleans, many years ago, attempted laryngotomy upon a child between four and five years of age, on account of the presence of a water-melon seed, inhaled forty-eight hours previously. The laryngeal artery was divided, and bled so profusely that the child was almost exhausted before the vessel could be secured. The wound being dressed, the operation was not resumed until two days after. The thyroid and cricoid cartilages were now exposed by repeated touches of the scalpel, and then divided from one extremity to the other, along with the upper rings of the trachea and the isthmus of the thyroid gland, which was mistaken for a muscle, and which bled most profusely, the blood spouting out furiously against the opposite wall, dashing into the face of the operator and those of his assistants, and rushing into the windpipe. Suffocation was prevented by turning the child upon the abdomen, and tying all the bleeding vessels in mass, except one, which was secured by a separate ligature. As soon as the hemorrhage had subsided, the

[1] Traité de Méd. Opératoire, p. 810. Paris, 1846.

[2] New Hampshire Journal of Medicine, vol. ii. p. 201. April, 1852.

[3] New England Journ. Med. and Surg. vol. xiv. p. 135, 1825.

child vomited, and threw up, apparently from the lungs, about half a pint of blood. Perfect recovery ensued.

Baron Boyer,[1] in a case of laryngo-tracheotomy, performed upon a boy nine years and a half old, who had inhaled a large bean, was obliged to tie not less than four veins. In another operation of a similar kind, he was compelled to tie several veins.

The hemorrhage accompanying these different operations may not only be great and embarrassing, but it may proceed to such an extent as to prove fatal, either immediately, or soon after. I have heard of at least half a dozen cases in which life was destroyed in this manner, though, in my own practice, I have never experienced the slightest inconvenience from any occurrence of this kind. Several of my operations, in fact, have been nearly bloodless. I can readily imagine, however, that very serious, if not fatal, hemorrhage might take place in the hands even of the most skilful operator, especially if he be not properly assisted, and if, as in the case of children, the patient be very unmanageable. Desault, whose manual dexterity and presence of mind no one can doubt, had the misfortune to lose a patient from this cause. A child was brought into his amphitheatre in consequence of having inhaled a foreign body. Tracheotomy was about to be performed, but, on the first incision, such a flow of blood occurred that it was obliged to be delayed in order to secure some vessels, and in the interval the patient expired.[2]

The following case, the particulars of which have been communicated to me by Dr. James D. Maxwell, of Indiana, occurred in the practice of Dr. Woolverton, of Vincennes, in that State. The foreign body was the end of a cane pipe-stem, about two inches in length, which was drawn into the windpipe of a child as he was lying by a streamlet, sucking the water through the tube. The boy was carried to Dr. Woolverton, and operated upon; but the result was unsuccessful, as he died upon the table from profuse hemorrhage. Dr. Hardin, of this city, has mentioned to me a similar case. A child, having inhaled an extraneous substance, had the trachea opened by an awkward and inexperienced operator, and died from hemorrhage immediately after.

[1] Traité des Maladies Chirurg. t. v. p. 503. Paris, 1846.

[2] Porter's Observations on the Surgical Pathology of the Larynx and Trachea, p. 213. London, 1837.

Hemorrhage is much more liable to attend tracheotomy and laryngo-tracheotomy than laryngotomy, properly so called. The latter operation, indeed, can rarely, from the situation and structure of the parts involved in it, be accompanied by serious, much less fatal, loss of blood. Some writers, it is true, in commenting on this operation, have expressed a different opinion; and in several of the cases cited in this treatise, as well as in some that have been communicated to me by my medical friends, great debility, excessive embarrassment in respiration, and even death, seem to have followed the opening of this portion of the windpipe. I have already, in a preceding paragraph, described the case of Dr. Cartwright, in which, in consequence of the division of the laryngeal artery, the bleeding was so profuse as to compel that gentleman to suspend all operative proceeding, on account of the great exhaustion of the little patient.

It is difficult to conceive how any vessels, so small as those concerned in laryngotomy, so superficially situated, and, in general, so easy of detection, should ever become a source of serious hemorrhage. The cause of the occurrence must, it appears to me, be sought in something else; as the awkwardness and alarm of the surgeon, a want of proper co-operation on the part of the assistants, or the existence of an anomalous artery, hid among the surrounding structures, and, consequently, difficult of ligation. When the patient is securely held, and the wound is made along the median line, any vessel lying in the track of the knife may be readily seized and tied the moment it is divided; thus rendering the loss of even a few drachms of blood a rare contingency. I should no more expect to lose a patient from hemorrhage in performing laryngotomy, than in amputating a man's little finger.

The bleeding in these operations may proceed from *various sources*, of which the most common are the smaller arteries and veins in front of the neck. Sometimes it is furnished almost exclusively by the former or latter of these vessels; and occasionally quite a considerable flow is occasioned by the division of the mucous membrane, especially when it is in a state of congestion, or inflammatory irritation, as it is apt to be when the foreign body has been retained for any length of time. Under such circumstances, the hemorrhage will of course be internal, and may proceed to such an extent as to cause the most serious impediment to the respiratory function. Whenever such an occurrence is threatened, the

proper treatment consists in turning the patient as speedily as possible upon his face, in order that the fluid may escape at the artificial opening as fast as it is effused.

The *arteries* which are mostly endangered in these operations are chiefly of anomalous character. This is particularly true of tracheotomy; in laryngotomy, the only regular artery liable to be wounded is, as has been already seen, the *crico-thyroid*, a small branch of the superior thyroid. This vessel, which, in the adult, is hardly the size of a knitting-needle, runs across the membrane connecting the thyroid and cricoid cartilages, and communicates with a similar offset from the other side. Its superficial situation at the middle line always renders it easy of detection and ligation. Whenever this artery is a source of considerable hemorrhage, it should be secured before the operator proceeds to open the larynx. Such a precaution will always effectually obviate embarrassment and danger.

The hemorrhage which follows the division of the crico-thyroid artery in laryngotomy is sometimes very embarrassing; and in a case mentioned by the late Professor Turner, of Edinburgh, a child bled to death from a wound of this vessel.[1] A similar accident came very near happening in the hands of Dr. Peschcux,[2] of Verneuil; a small artery, probably the crico-thyroid, having been divided, the blood rushed into the tube with such violence as to threaten immediate suffocation, and life was preserved only by sucking the wound with the mouth and inflating the lungs. The patient was a child, and the foreign body, a bean, was not expelled until five days after the operation.

The hemorrhage attending this operation occasionally proceeds from the *laryngeal* branch of the superior thyroid, as happened, probably, in Dr. Cartwright's case. This artery, commonly called the superior laryngeal, proceeds inwards, from its point of origin in the neck, in company with the superior laryngeal nerve, and finally pierces the thyro-hyoid membrane. It is distributed to the interior of the larynx, but before it enters this tube it is covered by the thyro-hyoid muscle. When this vessel extends as far over as the middle line, it may be wounded in performing laryngotomy, especially if, as sometimes happens, the knife is entered near the hyoid bone. Serious hemorrhage may also occur when this artery

[1] Fergusson's Practical Surgery, p. 475. Phil. 1853.

[2] Gazette Médicale de Paris, 29 Août, 1840.

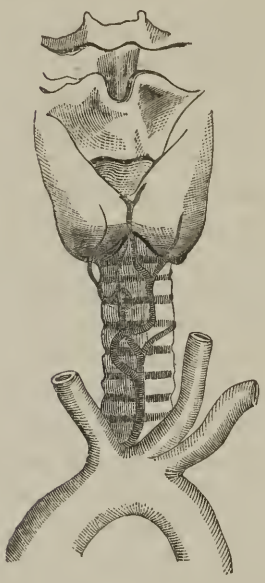
courses along the upper border of the larynx, or when it pierces the thyroid cartilage, and descends along the median line in contact with the posterior surface of the tube. The superior laryngeal artery may also be of very large size, and hence, if accidentally divided, a copious flow of blood may be the consequence.

It is probable that copious hemorrhage might arise, in connection with this operation, from the division of the superior thyroid artery, which certainly does not always pursue the same course in its passage to the thyroid gland. My attention was first particularly directed to this circumstance in the winter of 1853, by Dr. T. G. Richardson, the able Demonstrator of Anatomy in the University of Louisville, in an injected subject, apparently about thirty years of age, in which the superior thyroid of the left side lay directly in front of the crico-thyroid membrane, and in which, had laryngotomy been performed, this vessel, which was, moreover, uncommonly voluminous, would have inevitably been endangered by the knife. On the right side, the artery pursued its usual course. Although such a contingency must necessarily be very rare, it is proper that it should be borne in mind. The same remark is true with respect to the inferior thyroid arteries, which have occasionally, though very seldom, been found in front of the windpipe. Dr. Barclay, of Edinburgh, had a preparation illustrative of this anomalous course of these vessels. The two inferior thyroid arteries arose from the right subclavian, one of the branches lying nearly in front of the small vein which usually covers the trachea, and is so liable to be divided in opening this tube.

The arteries involved in tracheotomy are, as was before intimated, mainly of an anomalous character, being either branches which do not commonly exist, or which, if present, pursue an unusual course as they proceed to their respective points of destination, and are thus rendered liable to come within the range of the knife in our efforts to expose the windpipe. These anomalies, whether of origin or distribution, deserve to be carefully studied and remembered, for nothing short of such a course will enable the surgeon to meet the various contingencies that may arise during this operation, and qualify him to conduct the case, during the most difficult and trying stage of its progress, to a successful termination. There is no branch of operative surgery to which the ancient maxim, "to be forewarned is to be forearmed," applies with greater force than this.

One of the most common of these anomalous branches is the *middle thyroid* (Fig. 32), or, as it is sometimes denominated, the

Fig. 32.



fifth thyroid artery. This vessel, so interesting in relation to tracheotomy, was discovered by Dr. J. E. Neubauer, a German anatomist, but was first accurately described by his pupil Dr. Erdmann, in his Inaugural Dissertation, published at Jena in 1772. This writer applied to it the name of the *lowest* thyroid artery—thyroidea ima—an appellation by which it is generally known by the authors of continental Europe. Burns, Harrison, and several others have described it under the name of Neubauer's artery, in honor of its discoverer.

Considerable diversity prevails in regard to the volume, origin, and distribution of this vessel. Its *size*, on an average, does not exceed that of a crow-quill; occasionally, however, it is larger, and now and then, though rarely, it is quite diminutive. When it supplies, as it sometimes does, the place of the inferior thyroid artery of one or both sides, its volume is always considerably larger than it is under ordinary circumstances.

No precise information exists in regard to the frequency of the occurrence of this artery; a subject of no little interest in relation

to the operation of tracheotomy. Almost every museum, however small, furnishes examples of it. In my own dissections, I have met with it only a few times, perhaps not more than three or four. In a beautiful specimen, which I gave to my late colleague, Professor Cobb, the artery came off directly from the arch of the aorta, between the innominate and left carotid, and ascending in front of the trachea, distributed its branches mainly to the thyroid gland. My friend, Dr. T. G. Richardson, informs me that he has met with it altogether five times; once in connection with the aorta, and four times in connection with the innominate artery. Allan Burns[1] observed four cases. Tiedemann[2] saw it four, and Hubert[3] five times. Dr. Gruber,[4] who has written an excellent essay on the surgical anatomy of laryngotomy and tracheotomy, supposes that the vessel exists in one subject out of every ten.

This artery is sometimes *double*. In the instances examined by Dr. Gruber,[5] it exhibited this arrangement once in ten cases. When the vessel is double, one branch ordinarily arises from the innominate at the usual point, and the other from the primitive carotid. Sometimes they originate by a common trunk from the right subclavian, as in the case mentioned by Allan Burns. Hildebrandt[6] states that the middle thyroid artery has been found triple; but whether he alludes to his own dissections, or to the observations of his friends, it does not appear.

Allan Burns[7] describes a singular arrangement of this vessel, which may be appropriately referred to this head. In a child, six months of age, the innominate gave off a branch about the volume of a crow-quill, which ascended along the front of the trachea for a quarter of an inch, when it separated into two equal-sized twigs. From the left of these twigs, an artery of some volume was sent into the thymus gland, which, in this subject, was inordinately large. Soon after the origin of the thymic branch, the artery divided into six ramuscules, which, finger-like, embraced the inferior

[1] Surgical Anatomy of the Head and Neck, p. 418, Pattison's edition, Baltimore, 1823.

[2] Tab. Arteriar, p. 58. Karlsruhe, 1822.

[3] Acta Helvit. viii. p. 84.

[4] Oestereich. Med. Jahrbuch, Mai und Juni, 1845.

[5] *Op. cit.* 1845.

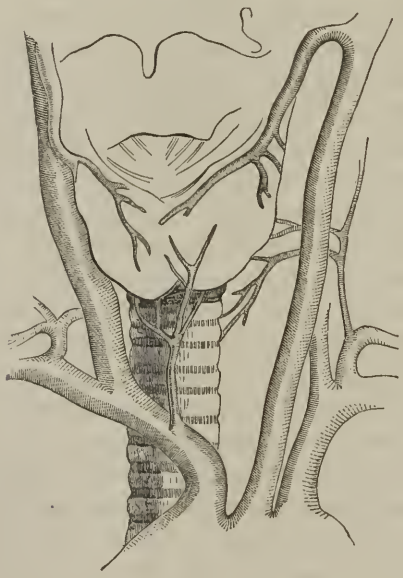
[6] Handbuch der Anat. des Menschen, B. 3, p. 206. Braunschweig, 1831.

[7] *Op. cit.* p. 417.

margin of the thyroid body. The other portion of the vessel sent some twigs to the sterno-hyoid and sterno-thyroid muscles, but the principal ones were lost in the body just mentioned. "The twigs of this anomalous artery, which, just above the chest, were few, large, and close to each other, subdivided and receded as they ascended, so that at last they covered not only the whole forepart of the trachea, but even overhung its sides."

The middle thyroid varies considerably in regard to its point of *origin*. Sometimes it is detached from the arch of the aorta, between the innominate and the left carotid, but, in general, from the innominate itself, as in Fig. 33. Occasionally, it has been ob-

Fig. 33.



served to arise from the right primitive carotid, and in a few rare instances it has been given off by the inferior thyroid, the thyroid axis, and the internal mammary.

The *course* of this vessel, which is a matter of some moment in relation to tracheotomy, must necessarily be considerably influenced by its origin. When it arises from the aorta, it usually ascends perpendicularly along the front of the windpipe to the thyroid body, to which most of its branches are distributed. But if, on

the other hand, as is generally the case, it is detached from the innominate, or some of the vessels above mentioned, it commonly, at first, lies towards the right side of the tube, a position from which it gradually inclines towards the middle line. The fact that the middle thyroid is more frequent on the right side than on the left, is of practical interest, and should, therefore, be remembered in our attempts to denude the trachea. The relative proportion of the occurrence is not ascertained. Huber[1] states that he met with it four times on the right side, and once only on the left.

This artery is occasionally very tortuous in its direction. Dr. James Blake, formerly Professor of Anatomy in the St. Louis University, met with an instance in a man, aged forty, in which it formed several curves in front of the trachea. The vessel, which was about the size of a crow-quill, arose from the antero-superior portion of the innominate, from which it ascended, crossing the trachea about three-quarters of an inch above the sternum. After proceeding about two lines beyond the median plane, it again turned to the right, and crossed the median plane about a fourth of an inch before the isthmus of the thyroid body, where it separated into its terminal branches.[2]

In March, 1850, in dissecting a male subject, probably twenty years of age, I found a middle thyroid artery arising from the left side of the innominate, immediately opposite the origin of the right subclavian, and about one inch from the arch of the aorta. It proceeded upwards, with a slight inclination to the left side, to the lower extremity of the left thyroid gland, to which it was distributed by several branches. The artery was quite as large as the left inferior thyroid in the natural state, and seemed to supply the place of that vessel, inasmuch as it was wanting. For about one-third of its course, it lay directly in front of the trachea; it then became tortuous, and changed its direction, inclining a little to the left side of the tube. The thyroid gland was somewhat larger than natural, especially the isthmus, and also considerably indurated. The arteries on the right side exhibited nothing unusual. The left superior thyroid was given off a little lower than common.

I also noticed in this subject a small lymphatic ganglion, directly over the crico-thyroid membrane, and two small veins,

[1] Acta Helv. viii. p. 84.

[2] Amer. Journ. Med. Sciences, New Series, vol. xvi. p. 264.

which united at the inferior portion of the membrane, forming a single trunk, which was lost in the isthmus of the thyroid gland. They had a triangular arrangement—thus >—. These structures would, of course, have been in the way of the knife in laryngotomy.

Irregularities occasionally occur in the origin and position of the *great arteries* of the neck, thus interfering with the movements of the knife in the operation in question. It is well known, for example, that the innominate may be unusually long, and that, instead of pursuing its ordinary course, it may cross the trachea a considerable distance above the sternum, as in figure 34. In some

Fig. 34.

instances, indeed, it runs along the front of this tube over a space of several inches. Burns[1] met with an instance where it ascended as high up as the inferior border of the thyroid gland.

Instances occur in which the left carotid, instead of being given off by the arch of the aorta, arises from the innominate. Whenever this is the case, the artery, in order to reach the opposite side, is obliged to cross the trachea some distance above the top of the sternum, and might thus be wounded by an incautious operator.

[1] Surgical Anatomy of the Head and Neck, p. 415. Baltimore, 1822.

This deviation, although witnessed by numerous anatomists, is fortunately of rare occurrence.

The two carotids sometimes arise by a common trunk between the two subclavians, as in the natural arrangement of the elephant. The anomalous innominate, under these circumstances, generally lies immediately in front of the trachea, and its two terminal branches also closely embrace this tube for a considerable portion of its extent; thus rendering them liable to be wounded in performing this operation. Serious, if not fatal, hemorrhage might also occur when, as occasionally happens, all the great cervical vessels arise separately from the aortic arch. In such a case, which, however, is very rare, the more central branches, as they proceed to their places of destination, overlap the windpipe to such an extent as to afford but little space for an operation of such delicacy and difficulty as that of tracheotomy.

Occasionally, again, the innominate and left carotid arise closely together, and lie nearly in contact with each other as they ascend the neck. Such an arrangement is represented in figure 35.

Fig. 35.

The subclavian arteries are seldom, if ever, in the way of the surgeon in his attempts to perform this operation. In their natu-

ral state they are situated so low down as to be completely out of the reach of the knife; but cases have been seen where they mounted a short distance above the clavicles, and in a few rare instances they have been observed to ascend from eight to twelve lines above the upper borders of these bones, and to bend, at the same time, some distance over the trachea.

But it would be an endless task to describe all the irregularities of these vessels, and to point out their relations to the operation of tracheotomy. The remarks which I have made embrace the more important facts of the case, and will suffice to put the surgeon upon his guard, whenever he is called upon to approach this part of the neck with his knife.

Those who are acquainted with the anatomy of the anterior cervical region are aware that the trachea, in this portion of its extent, is closely embraced by a *plexus of veins* (Fig. 36), which it is often

Fig. 36.

extremely difficult, if indeed not impossible, to avoid, even with the utmost precaution on the part of the operator. This plexus is formed by the inferior thyroid veins, which, after having emerged from the thyroid body, descend along the windpipe, anastomosing freely with each other in front of the tube, and finally terminating

in the brachio-cephalic veins at the root of the neck. These veins, which present an endless variety in regard to their number, size, course, and inter-communication, are joined by the tracheal and inferior laryngeal veins, and are often enormously distended in the struggles which the patient makes during the operation of tracheotomy.

Embarrassing hemorrhage, as stated elsewhere, has occasionally been caused by a wound of the *thyroid body*. Mr. Porter[1] thinks that a wound of either lobe will most certainly be followed by profuse bleeding, and in proof of his opinion, he affirms that he has himself witnessed some inconvenience from this accident. To avoid such an occurrence, which can scarcely happen, except where there is great enlargement of the organ, or the most wanton carelessness on the part of the operator, the structures should be held out of the way of the knife with the fingers, or a pair of blunt-hooks. If, in spite of this precaution, a wound be inflicted, the edges of the incision should be immediately embraced in a ligature, which will always promptly arrest the flow, and enable the surgeon to proceed with the operation.

A wound of the isthmus of this gland is sometimes productive of serious hemorrhage. This happened in the case of Dr. Cartwright, already detailed, where this portion of this body was mistaken for a muscle, and where the flow of blood was so copious as almost to destroy the little patient by suffocation. On the other hand, in a case reported to me by Dr. W. H. Van Buren, the isthmus was divided without the occurrence of any hemorrhage worth mentioning. Similar results followed in several instances described in this work. Nevertheless, as this accident is liable to happen, it should always be carefully guarded against, and this precaution, I conceive, is so much the more necessary whenever there is any unusual development of the isthmus.

A very capacious vein, the *anterior jugular*, is sometimes seen directly in front of the neck, along the middle line, and just beneath the common integuments, where it may be sadly in the way of the surgeon's knife. I have witnessed this arrangement repeatedly in the living subject, and once encountered it in the operation of tracheotomy. Mr. Wilde, of Dublin, in one instance, noticed a very large vein directly in this situation, but more

[1] Observations on the Surgical Pathology of the Larynx, p. 261. London, 1837.

deeply-seated, being placed in immediate contact with the front of the tube, and terminating in the internal jugular, by the side of the thyroid gland.

The *great veins* at the root of the neck are occasionally in danger of being wounded in tracheotomy. Allusion has already been made to a case in which Dr. Amasa Trowbridge opened the left subclavian, as it lay across the trachea. The instances, indeed, are not few where these vessels ascend a considerable distance above the top of the sternum, and where, consequently, they may be in the way of the knife in our attempts to extract foreign bodies from the windpipe.

It would appear almost incredible that the *carotid* artery should be wounded in this operation, and yet, such seems to have been the fact in at least one instance, the particulars of which are given by Desault.[1] The operation, however, was not performed with a view of extracting a foreign body, but for the purpose of resuscitating a young man who had been asphyxiated by drowning. The head and neck having been badly held, the knife forsook the middle line, and inadvertently entered the primitive carotid, thus causing instant death. Such an accident could, of course, never happen in the hands of a scientific operator. Beclard[2] relates an instance of wound of the innominate artery in the operation of tracheotomy.

From whatever source the hemorrhage in these operations may proceed, or however it may be induced, whether through carelessness or accident, the rule always is to arrest it, if possible, before we open the windpipe, in order that none of the blood may pass into the tube, and thereby endanger suffocation. The only exception to this rule is where, from the situation of the foreign body, or some other cause, the risk of strangulation is so great as to exceed that from the entrance of blood into the trachea, and where, consequently, the surgeon, in order to save life, is obliged to perforate the tube with the least possible delay. Such a contingency is, of course, rare, but as it is liable to occur, it is necessary that the operator should be aware of it, lest he be thrown off his guard, and thus become accessory to the patient's death.

Supposing that a contingency, such as that here alluded to, should arise, how is the surgeon to act? Promptly and efficiently, of course, otherwise the patient is lost, hopelessly lost. The instant

[1] Surgical Works, translated by Smith, vol. i. p. 235. Phila. 1814.

[2] Sedillot's Traité de Méd. Opératoire, p. 810. Paris, 1846.

the trachea is opened, the patient is to be turned upon his side or abdomen, with the head more or less dependent, and held in such a manner as to admit of the most ready application of the necessary ligatures. Sometimes the flow of blood may be temporarily arrested by compression by means of the finger, or a piece of sponge, until the breathing is sufficiently re-established to permit us to restore the body to its original position, and to ligate the bleeding vessels at our leisure.

When any considerable quantity of blood has passed into the windpipe, and the patient is so much exhausted as to be unable to eject it, it should be removed with all possible dispatch, either by inverting the body, and striking the chest at various points, or by means of a soft mop, composed of a small piece of sponge, tied to the end of a stick of whalebone; or, finally, by adopting the expedient so happily practised by Mons. Roux, in the case of a woman, into whose trachea he introduced a female catheter, with which he sucked out the blood, and thus saved her from suffocation. This method of the celebrated French surgeon, which cannot be too much praised, has been successfully followed several times since by other operators. An instance, for example, recently occurred at Cincinnati, in the hands of Dr. W. H. Mussey,[1] in which it was crowned by the most happy results. The trachea was loaded with blood and mucus, which were removed in this manner, when, by means of artificial respiration, the patient was gradually restored to life and consciousness. Mons. Pescheux,[2] of Verneuil, performed, not long ago, crico-thyroid bronchotomy in a little child for the removal of a bean, in whom he was obliged to employ similar means to prevent dissolution, which had already, apparently, taken place.

When the blood issues from numerous points, which do not admit, or justify the use of the ligature, its further effusion may generally be prevented by keeping the edges of the tracheal and muscular portions of the wound apart, by means of blunt-hooks secured to the neck by pieces of tape, and retained until the orifices of the vessels are sealed by plastic effusion.

It is worthy of remark that, when the hemorrhage is venous, it generally instantly ceases, even when it is copious, the moment the knife penetrates the windpipe. A knowledge of this fact is of vast

[1] Western Lancet, November, 1853.

[2] Brit. and Foreign Med. Rev. vol. xii. p. 256.

practical importance, and should, therefore, not be forgotten; for were the surgeon to act upon the principle of tying every bleeding vessel before he opens the tube, most injurious, if not fatal, delay might be occasioned. The veins of the neck, both superficial and deep, are frequently distended to their utmost, in consequence of the obstruction of the air-passages, or the struggles which the patient makes during the operation; a condition which, as a general rule, vanishes the moment the air enters the tube at the artificial aperture, and re-excites the lungs to renewed action.

To arrest hemorrhage, whether unavoidable or otherwise, in these operations, is one thing; to prevent it, another. To favor this result, so desirable in all operations, but particularly in those under consideration, should be one of the principal aims of the surgeon. This object will seldom, if ever, be difficult, if we reflect upon the various sources of the hemorrhage. We have only to proceed cautiously and deliberately, dividing one part after another, and pushing such vessels as may present themselves away from the front of the windpipe, and there can be no possible chance of anything like a copious loss of blood in one case out of fifty, if not in still greater proportion. In laying open the tube, it is a good rule always to carry the knife from below upwards with the back towards the sternum, as the danger of wounding the large vessels at the root of the neck is thus greatly diminished.

Secondary hemorrhage must be very rare after these operations, inasmuch as no mention is made of the circumstance in any of the cases that have fallen under my observation. The occurrence is, of course, possible, and should, therefore, be borne in mind by the surgeon. The bleeding may happen at a variable period after the operation, either in a few hours, or not under several days, just as in secondary hemorrhage in other parts of the body. The treatment consists in exposing the bleeding vessels, and securing them with the ligature; or, if this be impracticable, on account of the depth of the wound, or the peculiarity of the hemorrhage, in applying systematic compression. Styptics, if not wholly inadmissible, should be employed with great caution, otherwise they may pass into the trachea, and so become productive of severe irritation and cough.

The best compressing agent is the blunt-hook, used for separating the edges of the wound, or a silver canula, such as is generally

inserted for promoting respiration. The former should always, I think, have the preference in case the offending substance still remains in the windpipe.

SECTION XI.

DRESSING AND AFTER-TREATMENT.

The operation being completed, and the bleeding having been arrested, the next thing to be done is to dress the wound. The manner of doing this must depend upon circumstances. If the foreign body has been removed, and the respiration thoroughly re-established, the edges of the wound may be lightly approximated by a few narrow adhesive strips; but if the reverse is the case, they should be kept asunder by means of two blunt-hooks secured to the back of the neck with two pieces of gum-elastic tape. These hooks (Fig. 37), which are composed of silver, and from four to six

Fig. 37.

lines in breadth, should be retained for at least thirty-six hours, or until the parts have become thoroughly glazed with lymph, when they may be dispensed with. Of course, they are removed sooner if the extraneous body should happen to be expelled before this period.

To obviate the necessity of employing blunt-hooks, some writers have recommended the removal of a small piece of the windpipe at each side of the incision. Although the operation has been performed successfully, and has been adopted by some of the most distinguished surgeons, both in this country and in Europe, I must confess I have a dislike to it, amounting almost to an aversion; for it strikes me not only as unscientific, but as being calculated to lead to injurious contraction of the tube. It is for this reason that the practice ought, in my judgment, to be discountenanced. Indeed, I am not certain that it is always necessary even to employ blunt-hooks, for where proper care has been taken to make a free external and internal opening, the offending substance will generally be able to escape at the wound without such precaution.

Where the wound has been kept open for several days, and the necessity of maintaining it in this condition has ceased, the best plan is to approximate the edges with the twisted suture, care being taken to pass the needles deeply through the substance of the wound, but not through the walls of the windpipe; a procedure which could not be otherwise than prejudicial, and which must, therefore, be scrupulously avoided.

Should emphysema arise after the application of the dressings, they must be instantly removed, to afford a free passage to the air at the artificial opening. The same course is to be adopted in the event of internal hemorrhage, a still more serious accident, but which will rarely happen if the precaution be used of delaying the dressing of the wound until all bleeding has ceased.

In several of the cases detailed in this monograph, the surgical attendant introduced a silver canula into the wound, the foreign body being still in the air-passages. It would be difficult to conceive what motive could have prompted such a practice; if the object were to prevent the escape of the offending substance, hardly anything better could be selected for the purpose, unless it were a cork-stopper!

No lint should be placed over the wound, lest it should be drawn into the windpipe, and thus induce dangerous consequences. The fact is the dressings should be of the most simple character.

As long as the wound is open it must be protected with a piece of gauze, to prevent the ingress of flies, and of particles of matter floating in the air, or attached to the bed, body, or clothes of the patient. It should be arranged in the form of a bag, and be carefully

secured to the neck by pieces of tape or strips of adhesive plaster. It will be readily perceived that, if it were applied flat over the wound, it might effectually prevent the escape not only of blood and mucus but also of the foreign substance. A gauze covering is particularly necessary in warm weather, when the air is liable to be filled, both day and night, with all kinds of insects, almost any of which might be entrapped by the wound.

Some of the above directions may appear trivial, if not useless; but they can be so only in the opinion of those who place little estimate upon the results of surgical operations, and the value of human life. To the true surgeon and philanthropist, nothing is unimportant that has for its object the prevention of suffering and the preservation of existence.

The treatment after the operation, whether followed by the removal of the extraneous body or not, is a matter of paramount importance, and should, therefore, always receive the special consideration of the professional attendant. The operation itself is not without danger, and although it rarely proves fatal, yet, when it is recollected that it is performed for the purpose of getting rid of an offending substance in the air-passages, it will be readily perceived how injurious it may prove, both to the parts and to the system at large; how seriously, in short, it may affect the former, and how easily it may destroy the latter. The foreign body may have been retained for days before the windpipe is opened; but, even where this has not been the case—where, indeed, it has been expelled even within a comparatively short period after its introduction—there is always danger of severe inflammation of the lungs and air-tubes; and it is for this reason that the practitioner should always be on the alert, carefully watching his patient, lest the disease, thus awakened, should progress, and finally, perhaps before he is conscious of it, gain the ascendency.

The fact that the patient is not always safe, even after the removal of the offending body, cannot be too often repeated or too strongly impressed upon the mind of the practitioner. To conclude that an individual is no longer in danger of his life because he has been relieved of an extraneous substance in the lungs, is as absurd as it is in an ostrich to suppose that he is free from the pursuit of his enemy because he has buried his head under his wing. Taking into consideration the result of my experience, personal and collected, upon this subject, I assume that no person

is safe after an occurrence of this kind until the wound is perfectly healed, and until all laryngeal, tracheal, bronchial, and pulmonary symptoms have disappeared. Even then he should be carefully watched for some time, lest he should take cold or commit some dietetic indiscretion, and thus incur the risk of lighting up disease in structures which, when once irritated, are always peculiarly prone to morbid action.

The following case, reported more fully under the head of laryngotomy, while it illustrates the truth of my remarks, will place this subject in a more forcible light than any language which I can employ.

A boy, eight years old, having inhaled a grain of corn, was laryngotomized by Dr. Winlock and Dr. Moore, of Shelbyville, Kentucky, on the fourth day after the accident, after having in vain tried the effects of emetics. The breathing was much improved by the operation, but the foreign body failed to make its appearance. After a few days, during which the lad had occasional paroxysms of partial strangulation, he was brought to Louisville, and placed under my charge. He reached town about 11 o'clock in the morning, and in a few hours afterwards he ejected the grain of corn in a violent fit of coughing. A careful examination of the chest revealed the existence of a high grade of pneumonia, for the relief of which he was copiously bled and purged, and subjected to the use of tartrate of antimony and potash. Under this treatment, he so far recovered, in the course of a few days, that his friends, contrary to my most strenuous opposition, carried him home, a distance of thirty miles. The rest of the story is soon told. The disease, aggravated by premature exposure, rapidly increased in violence, a portion of the right lung became hepatized, and in a fortnight after he left Louisville, he threw up, in a fit of coughing, a large quantity of fetid matter, which he continued to expectorate until the time of his death, which, as Dr. Miller, one of his attendants, informed me, happened on the forty-fifth day after the accident.

The treatment necessary after these operations is, of course, the antiphlogistic, and it need hardly be stated that the time and manner of its employment must vary with each individual case. Purgatives, having mercury for their basis, are generally highly beneficial, and can seldom be dispensed with. A dose should always be given within a few hours after the patient has been put to bed, and, where the symptoms are at all urgent, it should be

repeated at least once every twelve hours. Expectorants are always useful, and should be exhibited at an early period after the accident, to allay cough, and promote the secretion of mucus. In children of tender age, ipecacuanha in combination with syrup of morphia is the most suitable remedy; but in adults nothing answers so well as tartar emetic, either alone, or in union with opiates. Where the pulse is strong and full, and the general excitement great, blood should be drawn early and freely from the arm, followed by leeches, cups, and blisters to the chest. The diet should be as light and bland as possible, and liberal use should be made of demulcent drinks. In a word, the treatment should be the same, in all respects, as in an ordinary case of pneumonia, bronchitis, laryngitis, or pleuro-pneumonia.

Too much stress cannot be laid upon the proper regulation of the temperature of the patient's apartment. The air, in ordinary breathing, is warmed in its passage through the mouth, nose, and fauces, and thereby prevented from doing harm to the lungs by chilling the lining membrane of the respiratory tubes. In tracheotomy, on the contrary, the air rushes in through the artificial opening, and is, therefore, likely to prove detrimental, unless we use the precaution of heating it. The temperature, on an average, should be from seventy to seventy-five degrees, and should be carefully regulated by the thermometer, that it may not be at one time too high, and at another too low; experience having shown that any sudden or great variations of temperature are always prejudicial. But this is not all; the air, to be wholesome, must not only be warm, but moist; and attention to one of these conditions is just as necessary as attention to the other. From neglect of this attention many lives are probably lost after the operation of bronchotomy.

The air of the apartment should not only be kept warm and moist, but it should also be free from dust. For this reason all sweeping and shaking of clothes should be carefully avoided in the presence of the patient, otherwise he will be sure to experience an aggravation of his cough.

It has been advised, where the foreign body does not escape spontaneously, or admit of easy extraction, to solicit its expulsion by fumigations, performed with slightly irritating substances, calculated to induce coughing. The suggestion is mentioned by Marjolin, in the third volume of the *Dictionnaire de Médecine;* but he does not refer to any authority, nor does he state that he himself

ever adopted it in his practice. I have no experience with it, and it does not seem to have been employed in any of the cases detailed in the present work.

The importance of tempering the air of the patient's apartment, in cases of tracheotomy, was strenuously insisted upon by Cæsalpinus in the latter part of the sixteenth century, and the subject was again brought under the notice of the profession about fifty years afterwards, by René Morcau, a French author. Modern practitioners have, there is reason to believe, too much neglected this subject. The above writers seem to have been fully aware, not only of the importance of heating the air which the patient is obliged to breathe, but also of the necessity of moistening it by the vapor of warm water.[1]

Finally, it would be interesting to know the precise condition of the windpipe and the front of the neck after the patient has recovered from this operation; but upon this point we have, unfortunately, no definite information. The only case at all bearing upon this subject is one which occurred in my own practice in May, 1850, in a child four years old, and which is detailed in the first article in the present chapter. The child is still living, and I find, upon examining the parts, that the trachea, at the line of the incision made in the operation, lies immediately beneath the scar left by the healing of the wound, forming a sharp central ridge, evidently produced by a partial overlapping of the edges of the wound in the tube. The sterno-hyoid and sterno-thyroid muscles of the two sides are separated by a space more than half an inch in width, and whenever the boy throws his head backward, so as to render the windpipe prominent, they present the appearance of two tense cords. The breathing is perfectly natural, having never been embarrassed since the removal of the foreign body. It is proper to add that the only dressings applied in this case were a few adhesive strips, a compress, and a roller. Where a small semi-elliptical portion is cut away on each side of the wound in the trachea, there must necessarily be some, if not an injurious, degree of contraction of the corresponding part of the tube.

[1] Louis, Memoir on Bronchotomy, *op. cit.* p. 237.

SECTION XII.

MORTALITY OF BRONCHOTOMY.

It would be interesting and instructive to determine, statistically, the mortality of the operation of bronchotomy; but, for the adjustment of this important question, our data are, unfortunately, altogether insufficient. The cases mentioned in this treatise are too few to enable us to arrive at any satisfactory conclusions, and we must, therefore, leave the whole subject to be settled by future observation. Meanwhile, however, it may be stated, as an established fact, that bronchotomy, in none of its forms, is a hazardous operation; and that it rarely proves fatal, except when it has been too long delayed, or when it is not followed by the ejection of the offending body.

The causes of death are various. The most common, undoubtedly, is inflammation of the lungs, which, as has been already seen, is liable to arise at various periods after the accident, and which often makes great, if not destructive, progress before bronchotomy is performed. When death results from this cause, it may take place soon after the operation; or, as is, perhaps, more generally the case, it may be delayed for a considerable time; until, in fact, the wound made in the operation shall have been completely cicatrized.

It should not be forgotten that death, after this operation, might be produced by the injudicious use of chloroform, or by protracted attempts at extracting the offending body. It has occasionally happened that the patient was actually moribund at the time of the operation, or that he became so before the windpipe could be properly laid open. In such cases, which cannot be adduced as fair examples of the operation, the parts should be freely divided without a moment's delay, and artificial respiration established by means of a tube inserted into the trachea.

Death is sometimes occasioned by an inordinate secretion and deposition of mucus at the former seat of the foreign body, or in its immediate vicinity. This appears to have been the cause of the fatal issue in a case which occurred in the practice of Dr. T. G. Geoghegan,[1] of Dublin, in a child, aged seven years, who had un-

[1] Dublin Medical Press for January, 1849, p. 49; also, Braithwaite's Retrospect, vol. viii. p. 154. 1849.

dergone laryngotomy on account of having inhaled a dog's tooth. The patient went on well enough until the night of the fifteenth day from the operation, when she was suddenly seized with difficulty of breathing, and expired. The dissection showed that death had been produced by a mass of thick, viscid mucus, which occupied the bifurcation of the trachea, and choked up the bronchial tubes. As the breathing was very tranquil just before death, Dr. Geoghegan thinks it probable that an inspiration, immediately consequent upon an unsuccessful attempt at expectoration, forced the mucus so firmly into these passages as to prevent its subsequent expulsion, thus inducing suffocation.

The operation of tracheotomy has been followed by death, in at least one instance, from the introduction of air into a vein of the neck. It is proper, however, to remark that the operation was undertaken for the relief of œdema of the glottis, and not for the purpose of removing a foreign body. It appears that a branch of the middle thyroid vein, situated exactly at the middle line, was pierced in the dissection, so as to allow the air to pass into the heart and great vessels. At the moment of the accident, a peculiar noise was heard, similar to that produced by the air rushing out of a tube which has been forcibly filled with water. The first thought of the operator and his assistant was, that the blood had passed into the trachea, which, however, as was subsequently ascertained, had not been opened. The patient, a woman, aged twenty-seven years, expired in less than two minutes.[1]

Occasionally, the immediate cause of death is apoplexy, the patient falling down in a fit of this disease, and, perhaps, expiring in an instant. Such a result, although unfrequent, is not surprising when it is recollected how liable the brain is to suffer from vascular turgescence in all affections attended with frequent and violent paroxysms of suffocative cough. In a case where tracheotomy had been too long delayed, Pelletan[2] found, on dissection, excessive fulness of the vessels of the brain.

Another cause of death is hemorrhage; but this occurrence is very unfrequent, and hardly deserves to be taken into the account. The hemorrhage may be fatal by the sudden ingress of blood into the windpipe, thereby arresting respiration; or it may be external, and destroy life by exhaustion.

[1] Dr. Heyfelder, Archives Générales de Médecine, 4th series, T. 14, p. 501. 1847.
[2] Clinique Chirurgicale, t. i. p. 3. Paris, 1810.

CHAPTER X.

LARYNGOTOMY.

SECTION I.

CASES OF LARYNGOTOMY, FOLLOWED BY THE EXPULSION OF THE FOREIGN BODY AND THE RECOVERY OF THE PATIENT.

THE number of cases embraced in this chapter is thirteen. By a reference to the table, it will be perceived that they were nearly all of short duration, the longest not exceeding five weeks. The previous treatment is not mentioned, except in four, in three of which emetics and other means were ineffectually tried, and in the other inversion of the body. The time at which the extraneous substance was extruded was generally immediately after the operation; in two it was the day after, in one in several days, and in one on the eleventh day. In five of the cases the expulsion took place under the influence of coughing, and in all the rest, except one, in which it is said to have been "spontaneous," it was effected by surgical interference; twice with the probe, once with the forceps, once with a bougie, once with a probang, once with a hook, and once with the fingers. In the case of Dr. J. M. Warren, two substances, the skin and kernel of a nut, were expelled immediately after the operation; the wound then healed, and a bit of nut was coughed up a short time afterwards, when all the symptoms at once subsided.

The operation in one instance, that of Dr. Hardy, was attended with copious hemorrhage, much blood falling into the windpipe, and nearly asphyxiating the little patient, who was restored only by artificial respiration. In Dr. J. M. Warren's case etherization was employed.

The foreign substances were, in two cases, plum-stones, and in the

remainder, respectively, a grain of corn, bit of nut, a cockle-bur, needle, grain of coffee, bell-button, water-melon seed, bone, sixpence, a bean, and fragments of corn. Ten of the patients were males, and three females. The ages, mentioned in all, except one, ranged from eighteen months to thirty years.

The symptoms were, in nearly all of the cases, unusually violent. In three, they were accompanied by aphonia, dependent, in two, if not in all, upon the lodgement of the foreign body in the larynx. In Mr. McNamara's case, in which the substance consisted of a plum-stone with a hole in the centre, there was a whistling noise in expiration, audible at some distance, and capable of being produced at pleasure. The pneumonic symptoms were slight, except at intervals. Towards the last, there was absence of respiration in the right lung, indicating that the foreign body was lodged in the corresponding bronchial tube.

The following cases of laryngotomy have been kindly communicated to me by Dr. John Shackleford, of Kentucky:—

A little boy, aged two years, having got a grain of corn into his windpipe, Dr. Shackleford, assisted by Dr. Frazee, opened the larynx, when, in a violent fit of coughing, the foreign substance was forced into the opening, from which it was removed without difficulty. The wound in the integuments healed kindly; but afterwards violent inflammation came on, followed by the formation of an abscess at the site of the incision; this was punctured, with immediate relief, and the patient had no bad symptoms subsequently. In another case, that of a boy five years old, the extraneous body, also a grain of corn, was distinctly seen immediately after opening the larynx; but in the convulsive breathing which ensued, it passed into one of the bronchial tubes, where it became apparently fixed. The external wound was kept open with soft sponge, and on the third day after the operation, in a violent paroxysm of spasmodic coughing, the grain of corn and piece of sponge were both expelled. The child recovered without any unfavorable symptoms. In the third case, a colored child, aged about twelve months, was in imminent danger of suffocation from the inhalation of a large bean. Laryngotomy was performed without delay, followed by the immediate ejection of the foreign body, and the rapid convalescence of the little patient.

Mons. Pescheux,[1] of Verneuil, had a case of crico-thyroid bron-

[1] Brit. and For. Med. Review, vol. xii. p. 256.

chotomy in a little child, in whom the foreign body, a bean, was expelled five days after the operation. A small artery was divided, and so much blood passed into the trachea that suction with the mouth and artificial inflation of the lungs were necessary to save the little patient.

TABLE OF CASES OF LARYNGOTOMY, FOLLOWED BY THE EXPULSION OF THE FOREIGN BODY AND THE RECOVERY OF THE PATIENT.

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	PREVIOUS TREATMENT.	TIME OF OPERATION.	ACCIDENT.	TIME AND MODE OF EXPULSION.	OPERATOR.	AUTHORITY.
1	Grain of corn	Male	3 years		Emetics and other remedies	24 hours		Several days; by coughing.	Dr. Richey	Guy W. Wright, Western Journ. Med. and Phys. Sciences, i. 664, 1827–8.
2	Plum-stone	Female	9 years	Respiration greatly embarrassed. hissing, husky, and gasping: inability to lie low with the head.	Emetic and probang	24 hours		Immediately; with a hook.	Sir Charles Bell	Institutes of Surgery, ii. 280, Lond. 1838
3	Cockle-bur	Male	15 yrs.	Great dyspnœa, aphonia, and pain and tenderness in the right side of the larynx.		2 days		Immediately; with the finger.	Dr. R. D. Mussey	Trans. Amer. Med. Association, iii. 362, 1850.
4	Plum-stone	Male		Slight, except at intervals; whistling noise in expiration; and, finally, absence of breathing in right lung.		3 days		Eleventh day; by coughing.	Mr. Rowdon McNamara	Dublin Hospital Reports, v. 590.
5	Bit of nut	Female	4 years	Violent cough, dyspnœa, and absence of respiratory murmur in the left lung.		4 days		Part immediately, and part at the end of several weeks; by coughing.	Dr. J. Mason Warren	Author.
6	Needle	Male	25 yrs.	Much cough and irritation, followed by great hoarseness, dysphagia, and almost entire aphonia; external swelling and pain.		5 days		Day after; spontaneous.	Mons. P. F. Blandin	Journal Hébdomad. de Méd. No. 1.
7	Grain of coffee	Male	5 years	Urgent after sixth day; extreme dyspnœa; lividity of face; great distension of jugular veins; inability to lie down.		6 days		Day after; with the probang.	Dr. John F. May	Amer. Journ. Med. Sci. April, 1852.
8	Pieces of corn	Male	18 mos.	Violent fits of coughing and suffocation; dyspnœa.		6 days		Immediately; by coughing.	Dr. J. Sipe	Author.
9	Bell-button	Male	8 years	Great dyspnœa, and frequent suffocative paroxysms; tightness across chest; absence of vesicular murmur on right side.	Emetics and other means	10th day		Immediately; with the forceps.	Mr. Dickin	Liston's Practical Surg. 418, 4th edition, 1846.
10	Water-melon seed	Male	3 years	Urgent; attacks of coughing and alarming and frequent dyspnœa.		11th day	Hemorrhage	Soon after; with the bougie.	Dr. J. F. E. Hardy	Transylvania Journ. Med. and Assoc. Sci iii. 267.
11	Bone	Female	28 yrs.	Violent, and threatening suffocation.		15 days		Immediately; by coughing.	Mons. Willaume	Arch. Gén. de Méd. xxiv. 445.
12	Sixpence	Male	30 yrs.	Dyspnœa; loss of voice; cough; vesicular murmur in both lungs.	Inversion of body	26 days		Immediately; with the probe.	Dr. J. O'Reilly	New York Med. Gazette, iii. 224.
13	Bean	Male	21 mos.	Severe at first, but less violent afterwards; body passing up and down windpipe.		5 weeks		Immediately; with the probe.	Dr. C. J. Thornton	Western Journ. Med. and Surgery, July, 1844.

NARRATIVE OF CASES OF LARYNGOTOMY, FOLLOWED BY THE EXPULSION OF THE FOREIGN BODY, AND THE RECOVERY OF THE PATIENT.

CASE 1.—*Grain of corn; boy, aged three years; useless employment of emetics; laryngotomy the day after the accident; expulsion of the foreign body several days after the operation, in a violent fit of coughing; recovery.* (Guy W. Wright, M.D., Western Journal of the Medical and Physical Sciences, vol. i. p. 664. Cincinnati, 1827–8.)

The subject of this case was a male child, three years old, whose parents resided in the vicinity of Hamilton, Ohio. When his medical attendant, Dr. Richey, first saw him, twenty-four hours had elapsed since the accident, and emetics and other means had already been employed, but in vain, for the expulsion of the corn. The operation was performed, in the usual manner, between the thyroid and cricoid cartilages. The foreign substance not appearing, the wound was kept open for several days, at the end of which, during a violent fit of coughing, it was discharged. The child recovered perfectly in less than a month.

CASE 2.—*Plum-stone; girl, aged nine years; useless employment of emetics; laryngotomy the day after the accident; immediate extraction of the foreign body with a probe; recovery.* (Sir Charles Bell, Institutes of Surgery, vol. ii. p. 280. Lond. 1838.)

Mary Waters, aged nine, while eating a plum at school, was reprimanded for laughing by the mistress, who at the same time gave her a slight tap on the cheek. At that moment, the child was sensible that the stone had descended into her throat, and she was immediately seized with a difficulty of breathing, which continued until she was finally relieved. A probang was passed into the œsophagus, and an emetic administered before she was brought to the hospital.

When Sir Charles Bell first saw the patient, the morning after the accident, her breathing was greatly embarrassed, being hissing and husky, and performed in sudden gasps; her nostrils were dilated; the chest heaved; the head and shoulders were obliged to be maintained in an elevated position; and she was excessively restless. Laryngotomy was immediately resorted to. The child, however, did not appear to be relieved, or only in a very slight degree. A probe was passed upwards through the glottis into the pharynx,

but no foreign substance was found; it was then directed downwards into the trachea, with no better success, but with the effect of augmenting the dyspnœa, and causing a certain degree of insensibility. A large gum catheter was then passed, when the breathing became considerably relieved, and afterwards the larynx was explored with the same instrument, but nothing was detected. Finally, he enlarged the wound downwards, and taking a probe and bending it at the end so as to make a hook, he carried it deeply into the trachea, where, catching the stone by its edge, he brought it to the wound, and readily extracted it with a pair of dressing forceps. All the bad symptoms at once disappeared, and the child promptly recovered.

Case 3.—*Cockle-bur; lad, aged fifteen years; loss of voice; laryngotomy two days after the accident; immediate extraction of the foreign body; return of the voice on the twenty-first day after the operation; recovery.* (R. D. Mussey, M. D., Transactions Amer. Med. Association, vol. iii. p. 362. 1850.)

A youth, aged fifteen, had got a cockle-bur—xanthemum strumarium—into his larynx, two days before he was seen by Professor Mussey, in 1850. He could not speak above a whisper, had paroxysms of great difficulty of breathing, and complained of pain and tenderness in the right side of the larynx. In the operation, the cricoid cartilage and the crico-thyroid membrane were divided; and after various but fruitless attempts had been made, with a pair of forceps and a silver director, bent into a hook, to dislodge the bur, this object was finally attained with the point of the index-finger, with which the foreign body was dug from its bed in the sinus of the larynx, and pushed up into the mouth, from whence it was discharged upon the floor. While this procedure was in progress, the boy was requested to suspend breathing, with a view of preventing the bur from dropping into the trachea, the lungs having been previously rendered easy by a few respirations. Before extrusion could be effected, it was necessary to divide the thyroid cartilage nearly as high up as its superior border. A considerable stream of blood followed the removal of the bur, owing to the injury inflicted upon the mucous membrane. The extraneous body was half an inch in length, olive-shaped, and covered with stiff, sharp prickles.

The wound healed kindly, and the voice suddenly returned on

the twenty-first day, while the patient was scolding his servant. He had previously been barely able to speak in a whisper.

Case 4.—*Plum-stone, with a hole in each side; boy; whistling noise, produced at pleasure during expiration; laryngotomy three days after the accident; subsequent dilatation of the wound, and expulsion of the foreign body on the eleventh day after the first operation; recovery.* (Dr. Rawdon McNamara, Dublin Hospital Reports, vol. iv. p. 590, 1830.)

Dennis Toole, a robust intelligent boy, was admitted into the Meath Hospital on Saturday, September 5, 1829, in consequence of having swallowed, on the Wednesday before, a plum-stone, which he had used as a whistle, having previously perforated it at the sides, and removed the kernel. He suffered but little inconvenience, except at intervals, when he was distressed by fits of suffocative cough; he played and ran about as usual, but complained of a dull pain at the ensiform cartilage; the countenance was bloated, and there was a slight sonorous râle in the upper part of the left lung, but, in other respects, the respiration was natural. The boy was able to make a whistling noise, audible at a considerable distance, whenever he was desired to do so; this he effected by forcibly expelling the air through the stone, but he never could produce it during inspiration. Laryngotomy being performed, and a sufficient time having elapsed without the stone appearing, a full-sized flexible catheter was passed through the opening to dislodge and push it into the pharynx. As the boy could no longer whistle, although he possessed that power the moment he was placed on the table, it was supposed that the attempt had succeeded, the more especially as there was an entire disappearance of the suffocative cough, and the patient strénuously asserted that he had swallowed the foreign body.

Nothing remarkable occurred for eight days. On Saturday, the 13th of September, upon examining the chest with the stethoscope, Dr. McNamara was astonished to find an absence of breathing on the right side, while the respiratory murmur on the left was more audible than natural, at the same time that the right sounded clear on percussion. On applying the instrument to the trachea he perceived a peculiar "ronflement," so indicative of a foreign body moving in that tube; in addition to this, the boy was now able to whistle, though faintly, through the stone, and it was curious to observe how the noise thus made, and the nullity of respiration

alternated; for whenever the stone was impacted in the right bronchial tube he was incapable of making the noise; and when he was able to whistle through the stone, the respiratory murmur of the right lung was natural. On Saturday, the 16th of September, the wound was dilated by dividing the trachea to the extent of half an inch, when the stone was forced out in a fit of coughing. No bad symptoms ensued, and the boy left the hospital in six days from the removal of the foreign body.

Case 5.—*Bit of nut; girl, aged four years; violent cough, dyspnœa, and absence of respiratory murmur on the left side; laryngotomy at the end of the fourth day, the patient being etherized; immediate ejection of the skin and kernel of a nut, followed by a small bit of the shell at the end of a few weeks; recovery.* (Communicated to the author by J. Mason Warren, M. D., Boston.)

Dr. Warren was requested to see this child on the 6th of April, 1851, in consultation with Dr. Wild, of Jamaica Plains, near Boston, she having inhaled four days previously a bit of nut. She had been immediately seized with violent coughing, paroxysms of which had continued to recur, at intervals, since the accident. When Dr. Warren visited her, the countenance was livid, the breathing difficult, and the strength much impaired. Auscultation revealed a great diminution of the respiratory murmur in the left lung, with some râle; while on the right side it was distinctly puerile.

As the symptoms were urgent, the crico-thyroid membrane was immediately divided, the child being previously put under the influence of ether. A bougie, slightly bent, being passed into the left bronchial tube, the substance was readily dislodged, followed by the forcible expulsion at the artificial opening of the skin and kernel of a nut. Some further search being made, under the supposition that some other part of the offending body might still remain, the operation was concluded, and the child put to bed.

On the following day, the patient was doing well, and appeared greatly relieved by the operation. From this time on the wound healed rapidly, and she was soon able to go about. Some cough, however, remained, accompanied with a mucous râle in the left lung, leading to the belief that it was still embarrassed by a part of the foreign body. This was, in fact, the case; for at the end of a few weeks the child suddenly brought up, in a paroxysm of cough-

ing, a small bit of nutshell. All the symptoms now disappeared, and she rapidly regained her health.

CASE 6.—*Sewing-needle; man, aged twenty-five; cough, hoarseness, dysphagia, and almost complete aphonia; laryngotomy at the end of the fifth day; expulsion on the morning after the operation; recovery.* (Mons. P. F. Blandin, Journal Hébdomadaire de Médecine, No. 1, 1829; Amer. Journ. Medical Sciences, vol. iv. p. 243, 1829.)

A man, twenty-five years of age, let a needle slip into the nose, from which it passed, along with the large thread with which it was armed, into the pharynx, and finally into the larynx. Much cough and irritation being excited, the thread was thrown out of the mouth, when the patient endeavored, but in vain, to extract the needle by pulling at the thread. He entered the hospital on the 18th of June, 1828, laboring under a remarkable hoarseness, dysphagia, frequent cough, and almost entire aphonia. The parts about the larynx were much swollen, and the integuments were red and painful. The thread soon after this disappeared in an effort at deglutition, but was ejected again on the evening of the 21st, thus enabling Blandin to ascertain that the needle had entered the mouth of the larynx on the left side of the epiglottis. The symptoms becoming more urgent, laryngotomy was performed the next day, the thyroid cartilage being divided in its whole length along the middle line. An attempt was made to discover and remove the needle by means of the forceps, but it induced so much irritation as to compel the operator to desist. The wound was covered with a perforated compress, spread with cerate, and the patient put to bed; he passed a tranquil night, and the next day the needle, of a black color, and nineteen lines in length, was found in the dressing. The parts gradually healed, and a complete cure followed, though the voice remained hoarse and feeble for several months.

CASE 7.—*Grain of coffee; boy, aged five years; cough, dyspnœa, and partial aphonia; laryngotomy six days after the accident; removal of the foreign body, next day, with a probang; recovery.* (Dr. John F. May, Amer. Journ. Med. Sciences, April, 1852, p. 412.)

A boy, five years of age, was suddenly seized with a very severe fit of spasmodic cough, in consequence of having swallowed a grain of coffee, which, a few minutes before, had been seen in his mouth.

The cough was soon followed by difficult respiration, which, though very distressing, was occasionally succeeded by such intervals of ease as to induce the belief that the foreign substance might have been ejected. Six days after the accident, however, when Dr. May first saw the child, the symptoms were of the most urgent character; the dyspnœa was extreme; the little patient could not lie down; the lips and face were livid; there was a constant frothy discharge from the mouth; the jugular veins were greatly distended; and there was a strong mucous rhonchus throughout the lungs and trachea. An incision, half an inch in length, was made through the crico-thyroid ligament and the cricoid cartilage, followed by the escape of a large quantity of thick, yellow mucus, with great improvement in all the symptoms. The foreign body could not, however, be discovered, and upon closing the wound with the fingers, the cough and dyspnœa at once returned with all their former violence. A curved probe, wrapped with a soft piece of linen, was repeatedly passed through the upper part of the larynx, but without encountering the cause of the obstruction. The wound was left open, and the child put to bed; the night was spent very comfortably, but on closing the opening next morning, the bad symptoms immediately returned. A whalebone probang, the sponge of which accurately fitted the larynx, was now carried twice up into the fauces, when, on repeating the experiment already several times mentioned, it was found that there was no recurrence of cough or difficulty of breathing. The edges of the wound were now brought closely together by suture and adhesive plaster; and half an ounce of oil being administered, the grain of coffee was discovered entire in the first evacuation. The child soon recovered, with the exception of a hoarseness and roughness in the voice, which, however, disappeared in a few weeks.

Case 8.—*Pieces of parched corn; boy, aged eighteen months; violent fits of coughing and suffocation; laryngotomy at the end of the sixth day; ejection of six fragments of corn immediately after the operation, and of about the same number during the course of the same day; recovery.* (Communicated to the Author by Jacob Sipe, M. D., of Missouri.)

On the 1st of April, 1854, a boy, aged eighteen months, son of Joseph Stewart, of Harlan County, Kentucky, while chewing parched corn, began to cry, and, in the act of taking a long and sudden inspiration, allowed a number of pieces to pass into his

windpipe. A violent paroxysm of coughing and suffocation was the immediate effect of the accident. Dr. Sipe did not see the child until the 6th of the month. He found him laboring under great dyspnœa, attended with a wheezing noise, but with no symptoms denotive of the precise situation of the foreign bodies. The diagnosis, however, was sufficiently evident, and he was therefore induced to open the larynx the morning after his first visit. Six pieces of corn, of various dimensions, were immediately ejected at the wound, and about the same number were expelled during the course of the day. No untoward symptoms occurred; but on the seventh day after the operation the little patient had some fever and an increase of coughing, and in the evening he threw up another fragment of corn, a portion equal to about a third of a grain, softened, and covered with pus. The wound had been left open until the third day, when it was partially closed. Everything went on favorably, and in three weeks the child was able to go home.

Case 9.—*Bell-button; boy, aged eight years; violent suffocative symptoms; remarkable loss of symmetry on the right side of the chest; emetics; laryngotomy on the tenth day; immediate extraction of the foreign substance with the forceps; recovery.* (Mr. Liston, Practical Surgery, 4th edition, p. 418. London, 1846.)

This case occurred in 1832, in the practice of Mr. Oswald Dickin, of Middleton, near Manchester, England. The subject of it was a boy, eight years old, who, having a bell-button in his mouth, allowed it, while he was in the act of jumping, to pass into his windpipe. He instantly fell down, seemingly in a state of asphyxia; he was then taken home, a few yards distant, making the most violent efforts to respire. After this, his breathing became easy, but the disposition to cough continued, and he had frequent suffocative paroxysms, which greatly alarmed and agitated him. He complained of a sense of constriction across the chest, and the countenance had a livid, anxious appearance. On examining the chest, three days afterwards, there was found to be a remarkable loss of symmetry on the right side, with evident depression and altered action in breathing. The stethoscope detected no respiratory murmur, while on the left side everything, both externally and within, was natural. On the sixth day the cough ceased, and also the fits of suffocation; circumstances clearly indicating a fixed position of

the foreign body. Emetics and other simple means were used, but without effect. On the tenth day, it was determined to perform laryngotomy between the cricoid and thyroid cartilages; which being done, a pair of forceps, invented for the purpose, was carried into the trachea, and used as a sound; the metallic body was at once detected, and, upon reintroducing the instrument, which was done without the slightest inconvenience to the patient, it was immediately seized and extracted. It was evidently situated in the right bronchial tube. For several days, muco-purulent matter was discharged pretty freely by the wound; but this soon ceased, and in a fortnight the boy was well enough to return to school.

Case 10.— *Water-melon seed; boy, aged nearly three years; cough and dyspnœa; laryngotomy at the end of the eleventh day; alarming hemorrhage; artificial respiration; situation of the foreign body in the larynx; recovery.* (Dr. J. F. E. Hardy, Transylvania Journ. Med. and the Associate Sciences, vol. iii. p. 267. Lexington, 1830.)

A boy, nearly three years of age, inhaled, while eating some water-melon, one of the seeds into his windpipe. He became instantly suffocated, and, for some hours, his recovery was doubtful; he, however, revived, and from this time until the operation, eleven days afterwards, he had frequent alarming attacks of cough, and difficult respiration. An opening was made through the crico-thyroid membrane, but this being found insufficient, the thyroid and cricoid cartilages were divided to the extent of two inches. On completing this part of the operation, a most alarming and dangerous hemorrhage occurred, the blood rushing into the windpipe, and strangling the child to such a degree that he was to all appearances dead. A canula was immediately introduced to inflate the lungs, while the divided vessels were secured with the ligature, and in about half an hour the respiration was re-established. A bougie, carried soon after through the artificial opening into the mouth, dislodged the foreign body, which had evidently been impacted in the larynx. The child had a constant wheezing and cough for a fortnight; but he gradually recovered, and perfectly regained his voice.

Case 11.—*Piece of bone; woman, aged twenty-eight; cough, dyspnœa, and pain; pregnancy, and enlarged thyroid gland; laryngotomy at the end of fifteen days; immediate expulsion of the substance in a fit of coughing; recovery.* (M. Willaume, Archives Générales, t. 24, p. 443, 1830; North American Med. and Surg. Journ. vol. xii. p. 480.)

A female, aged twenty-eight years, whose case is recorded by M. Willaume, chief surgeon of the Military Hospital at Metz, having inhaled, while taking some soup, a fragment of bone, became affected with the most distressing symptoms, such as cough, dyspnœa, pain, agitation, and retching, which usually occurred in paroxysms, and which progressed to such an extent as to render an operation imperatively necessary to preserve her life. What added greatly to the interest of the case was the fact that the patient was in the fifth month of pregnancy, and that she was laboring under a large goitre. The operation was performed at the end of the fifteenth day. The enlarged gland was depressed as much as possible, and, after some difficulty, M. Willaume succeeded in dividing the cricothyroid membrane with a bistoury, the incision being prolonged through the thyroid cartilage, along the middle line, in its entire extent. The patient, instead of being relieved, was seized with a violent paroxysm of dyspnœa, threatening instant suffocation. This having subsided, the ventricles of the larynx were examined with the finger introduced into the wound, but no foreign body was detected. A probe was then passed down the trachea, where it encountered some resistance from the bone, which, after some little manœuvring, was detached, and presently expelled, along with a large quantity of mucus, in a violent paroxysm of coughing. No vessels of importance were divided; the wound soon healed; the voice was not impaired, and delivery occurred at the natural period. The bone, of an irregular shape, and quite sharp at several points, was six lines in length by about five lines in breadth.

Case 12.—*Sixpence; man, aged thirty years; loss of voice; inversion of the body; laryngotomy at the end of the twenty-sixth day; immediate ejection of the foreign substance into the mouth, and its discharge by the bowels; recovery.* (Dr. J. O'Reilly, New York Medical Gazette, vol. iii. p. 224, 1852.)

Mr. Mullins, aged thirty, on the 21st of May, 1852, allowed a sixpence, which he held in his mouth to pay his stage-fare, to slip

into his windpipe. He was immediately seized with a fit of suffocation and loss of voice, the former of which soon subsided, but the latter persisted. For some nights after the accident his breathing was so difficult as to compel him to leave his bed, and open the windows of his apartment to let in the air. On the 27th of May, when he consulted Dr. O'Reilly, he had loss of voice, laryngeal cough, and an anxious expression of countenance, but the vesicular murmur was natural in both lungs, there being no mucous râle, or any evidence of inflammation. The patient had taken emetics without relief, and his body was now inverted several times with no better effect. Believing that the coin was impacted in the larynx, it was determined to open this tube. Accordingly, on the 16th of June, a crucial incision was made through the crico-thyroid membrane, when, upon introducing a probe, the sixpence was readily detected in the left ventricle, from which, in endeavoring to extract it with the forceps, it was pushed up into the mouth, the man instantly declaring, in a *loud* voice, "I have swallowed it." Immediately after the operation, a purgative bolus was directed, and, after some time, the coin was voided along with the feces. The case went on most favorably; the wound healed kindly; the voice returned, and the general health improved.

The patient, a short time after he had swallowed the sixpence, imagined that it was still in the windpipe, and that it had merely changed its position. To gratify him, Dr. O'Reilly searched for it again, and for a few minutes thought that he himself had been deceived, owing to the fact that the cartilage of the larynx was so much ossified as to impart, when struck, a metallic sound.

Case 13.—*Long garden bean; boy, twenty-one months old; cough and suffocation; body playing up and down in the trachea; laryngotomy at the end of five weeks; immediate extraction; recovery.* (Dr. C. J. Thornton, Western Journ. of Med. and Surg. July, 1844.)

A little boy, twenty-one months old, playing with beans of the "long white variety," was suddenly seized with fits of coughing and suffocation. After repeated paroxysms, he became comparatively tranquil, but suffered subsequently at intervals, though not so violently as at first. Dr. Thornton being called in three weeks after the accident, readily detected the presence of a foreign body in the windpipe, passing up and down at every expiration and in-

spiration. The symptoms being mild, the parents refused their assent to an operation, until "some weeks" after, when the child was laboring under extensive inflammation of the mucous membrane of the lungs and trachea, attended with great difficulty of breathing, stridor, constant and distressing cough, and puriform expectoration. Laryngotomy was now performed, and the bean pushed through the rima of the glottis with a probe. The child speedily recovered.

SECTION II.

CASES OF LARYNGOTOMY, FOLLOWED BY THE DEATH OF THE PATIENT.

Death from laryngotomy, or its effects, must either be exceedingly unfrequent, or practitioners must be sadly negligent in publishing the results of their observation and experience. Of the four cases which compose this section, one is recorded in a Western periodical, another occurred in my own neighborhood, and the other two have been recently communicated to me by Dr. J. M. Warren, and Dr. John Shackleford. In my bibliothecal researches, comprising many hundred volumes, I have not found another example of the kind; and hence, although it is very probable that I may have overlooked some cases, it is reasonable to infer that the operation in question is rarely followed by fatal effects.

In one of the cases herein detailed, death, I have reason to believe, was not the result of the operation but of the culpable negligence of the friends and nurses of the patient. A careful examination of the facts of the case, as observed by myself and others, will, I think, fully substantiate the truth of this remark. Had the boy not been exposed to the fatigue and annoyances of a ride of thirty miles soon after the expulsion of the foreign body, and while the lungs were in a state of pretty high inflammation, he would, in all human probability, have soon entirely recovered, both from the effects of the operation and from the mischief done by the presence of the extraneous substance. In the case recorded by the late lamented Drake, the operation may have been the immediate cause of death, though upon this point nothing positively can be alleged,

owing to the imperfect character of the report. Dr. Shackleford's case ended fatally about ten days after the operation, and the grain of corn, which was found in the larynx, near the incision, was in a very swollen and sprouting condition. In Dr. J. M. Warren's case, the patient, a girl, aged eight years, had inhaled a piece of birch bark, which, after having induced the usual phenomena, finally lodged in the left bronchial tube, causing death nearly one month after the operation, and nearly one month and a half after the accident.

Case 1.—*Grain of corn; boy, aged two years; laryngotomy on the second day; death at the end of the sixth day from the operation; discovery of the foreign substance in the lower part of the trachea.* (Dr. Daniel Drake, Western Journ. Med. and Physical Sciences, vol. vi. p. 164, 1833.)

The operator in this case was Dr. McCulloch, of Ohio. The patient, a child, about two years of age, was playing upon his back with some grains of corn in his mouth, when one of them slipped into the trachea. The violent paroxysms of convulsive breathing induced the parents to request an operation, which was accordingly performed on the second day. The larynx was opened without difficulty, no hemorrhage occurring to impede the proceeding, but the foreign body could not be found. The child lived six days after the operation; and, on dissection, the corn was discovered in the trachea, imbedded in mucus.

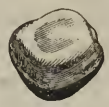
Case 2.—*Grain of corn; boy, aged eight years; repeated emetics; laryngotomy on the fourth day; ejection of the foreign substance four days after; inflammation and abscess of the lungs; death on the forty-fifth day after the accident.* (Author.)

On the 4th of June, 1847, W. Churchill, a sprightly lad, eight years of age, was brought to me from Shelbyville, Kentucky, where he had, on the 27th of May previously, inhaled a grain of corn, which he happened to be holding in his mouth, while running about in the street. The urgent symptoms soon subsided, and nothing was attempted for his relief until the next morning, when an emetic of ipecacuanha was administered. This was repeated every morning for three successive days, without any other effect than that of clearing the bronchial tubes of mucus. The symptoms becoming more urgent, and suffocation being threatened, laryngotomy was

performed by his professional attendants, Dr. Winlock and Dr. Moore; the breathing was much improved, but the foreign substance did not appear. A few days now passed with occasional paroxysms of partial suffocation, when the boy was removed to Louisville, where he arrived on the 4th of June.

I was requested to see the patient at 11 o'clock in the morning, but being obliged to go into the country, it was nearly four in the afternoon before I reached him. As I was approaching his lodgings, a messenger met me, stating that the lad had just ejected the grain of corn by the mouth, in a violent paroxysm of coughing, as he was lying with his head over the edge of the bed. A careful examination of the chest satisfied me of the existence of a high grade of inflammation of the lungs, especially the right. I therefore at once bled him copiously at the arm, and ordered a dose of purgative medicine. The next morning his breathing was much relieved, but there was still sufficient embarrassment to justify the application of leeches and the use of tartar emetic. The following Monday, that is, four days after I first saw the boy, he was, contrary to my wishes, taken home, where his symptoms soon assumed the most formidable character. Hectic fever rapidly supervened, and the lower lobe of the right lung gave evidence, on percussing the chest, of being in a state of hepatization. Fourteen days after he left Louisville he threw up, in a fit of coughing, a large quantity of offensive matter, which continued to be discharged freely until the 11th of July, the day of his death. No *post-mortem* examination was made.

Fig. 38.



CASE 3.—*Grain of corn; boy, aged six years; ordinary symptoms; laryngotomy soon after the occurrence of the accident; death about ten days after the operation; situation of the foreign body in the larynx.* (Communicated to the author by Dr. John Shackleford, of Maysville, Kentucky.)

A negro boy, aged six years, on the 1st of June, 1838, inadvertently inhaled a grain of corn. He was seen soon after the occurrence of the accident by Dr. McAdow, of Mason County, who found him laboring under the usual symptoms. At a consultation, it was agreed that the only remedy was laryngotomy, which was accordingly performed by Dr. Shackleford. The foreign substance not making its appearance, the wound was kept open in the hope that

it might be expelled in a violent paroxysm of coughing. Gradually, however, the wound closed, and about ten days after the operation the boy died of suffocation. An examination was made by Dr. McAdow, who found the grain of corn in the larynx, near the incision, in a very swollen and sprouting condition.

Case 4.—*Piece of birch bark; girl, aged eight years; cough and suffocation; probable lodgement of the substance in the left bronchial tube; laryngotomy on the sixteenth day; etherization; vain attempts at extraction; inversion of the body; death at the end of a month and a half after the accident; inflammation of the left lung and pleura; bark in the trachea.* (Communicated to the author, by J. Mason Warren, M. D., of Boston.)

On the 26th of November, 1850, a girl, eight years old, while engaged in chewing a bit of birch bark, for the purpose of making "red spittle," in a fit of laughter allowed it to slip into the windpipe. The accident was instantly followed by a paroxysm of coughing and suffocation, which continued to recur at intervals for nearly a week A sudden change in the position of the substance, on the 1st of December, was succeeded by a return of such violent coughing and strangulation as to excite fears as to the immediate result. At the end of the paroxysm the bark settled down into one of the bronchial tubes, with a mitigation of the severe symptoms. Dr. Warren saw the child for the first time on the 9th of December, when the breathing was much oppressed, and she had a constant dry cough; she looked haggard, and the countenance had a livid hue, indicative of imperfect aeration of the blood; the skin was hot and dry; the pulse one hundred, and the appetite lost. The left side of the chest was rather more flat on percussion than the right, and scarcely any respiratory murmur could be detected in the posterior part of the corresponding lung; some mucus râle existed on a level with the bifurcation of the trachea. In front, however, especially above, the breathing was still performed, though very feebly. On the right side the respiration was puerile. All these circumstances denoted that the substance was lodged in the left bronchial tube.

The night after the examination the girl had a renewed paroxysm of coughing, during which she received the impression that the substance had become again dislodged, and passed up into the larynx. The attack was attended with slight epistaxis.

Laryngotomy was performed on the 12th of December, the patient being fully etherized. A pair of forceps, six inches in length, and so constructed as to open only an inch at the end, was then carried down into the left bronchial tube, but without grasping the offending substance. The operation was thrice repeated, the instrument being retained each time about one minute, without apparently the slightest inconvenience to the child. The patient was next suspended by the heels, at the same time that the throat was irritated to provoke free vomiting; without avail, however, as it regarded the object in view. Finally, the abdomen was compressed, and the air in the lungs suddenly and violently expelled by the hands applied to the chest. The child, considerably exhausted, was put into bed, a piece of gauze being placed over the opening. She spent a quiet night, her cough being much mitigated; and the wound manifested a disposition to close, the air issuing through it only during violent respiratory efforts.

After having remained in Boston several weeks, much in the above condition, except with an increased disposition to general pulmonary engorgement, the child was taken home and placed under the care of Dr. Morrison, of Athol, New Hampshire. She expired on the 9th of January, 1851, nearly a month after the operation, and nearly one month and a half after the accident. The right lung was found in a healthy state, there being only some slight pleuritic adhesions. The left lung, which was dark-colored and pitted on pressure, was firmly attached to the diaphragm, and excessively loaded with blood and serum. The bronchial canals were filled with muco-purulent matter, and those on the left side were in a state of high inflammation. The offending body, which had the appearance of being much swollen, and which was three-quarters of an inch long by a quarter of an inch in breadth, was found lying loose in the trachea, having evidently been accidentally pushed up, during the examination, from the left bronchial tube, as there were marks of its having been impacted in its interior.

CHAPTER XI.

TRACHEOTOMY.

SECTION I.

CASES OF TRACHEOTOMY, FOLLOWED BY THE EXPULSION OF THE FOREIGN BODY AND THE RECOVERY OF THE PATIENT.

THE subjoined cases, sixty in number, are offered as illustrations of the effects of tracheotomy. The operation, performed at a variable period after the accident, was followed in every instance by the ejection or removal of the extraneous substance, and the recovery of the patient. It will be perceived that the longest time which intervened, in any one case, between the occurrence of the accident and the operation, was seven months, while in the majority of instances it did not exceed a week, ten days, or a fortnight.

The foreign bodies consisted, in fourteen of the cases, of beans, in five of pebbles, in five of water-melon seeds, in four of grains of corn, in two of bone, in two of nails, and in the remainder, respectively, of a piece of crystal, a piece of silver tube, the larynx of a goose, a grain of coffee, pipe-stem, plum-stone, a piece of earthen cup, shawl-pin, button-mould, glass bead, jawbone of a mackerel, prune-stone, citron-melon seed, brass button, kernel of a hickory nut, hazel-nut shell, acorn, piece of the claw of a lobster, brass ring, cherry stone, half sovereign, persimmon seed, piece of cocoa-nut, a fiddle-peg, a gravel, and the stopper of an inkstand. In three of the above cases, the bodies were multiple; consisting, in one, of a water-melon seed and the shank of a plum, in another, of a gravel and several fragments of beans, and in the third, of two citron-melon seeds.

The sex is stated in only fifty-one of the cases, of which twenty-seven were males, and twenty-four females. Twenty-nine of the

cases were under five years of age, seventeen under ten years, five under fifteen, two under twenty, one under thirty, and one under forty. In five, the age is not stated.

The prominent symptoms, in nearly all the cases, were violent coughing, and a sense of suffocation; these, after having lasted from a few minutes to half an hour or upwards, were generally succeeded by a calm, and this, in its turn, by a reproduction of the former distress. In some of the cases, especially in those in which the foreign body was arrested in the larynx, there was aphonia, with hoarseness, hissing, or croupy sound in breathing. A very common occurrence was dyspnœa. In a few of the cases, the symptoms exhibited an asthmatic character; in five, the body moved up and down the trachea.

The treatment, previous to the operation, consisted, in eight cases, of emetics and other means; of emetics alone in three; of inversion and other means in two; of errhines and emetics in two; of emetics and inversion in one; of inversion alone in one; of anodynes and expectorants in one; of bleeding in one; of anthelmintics in one; and of "various means" in one. The probang was passed into the œsophagus in two cases. In the other cases no mention is made of any preliminary treatment.

The time of operation is noted in all the cases. In eighteen it was performed before the end of the second day; in three at the end of the second day; in four at the end of the third day; in one after several days; in one on the fourth day; in four on the fifth day; in two on the sixth; in three on the seventh; in three on the eighth; in one on the tenth; in one on the eleventh; in one on the thirteenth; in one on the fifteenth; in two on the nineteenth; in one on the twenty-first; in one on the twenty-fourth; in one on the twenty-eighth; in one on the thirty-fifth; in one on the forty-second; in one on the fifty-eighth; and in one on the sixty-fifth day. In the remaining eight cases the operation was performed at two and a half, three, three and a half, four, six, six and a half, and seven months.

In nine of the cases the operation was attended with hemorrhage. In four, the bleeding was very copious; in one so much so as to cause syncope. In one of the latter cases the hemorrhage was venous.

The time of the ejection of the foreign body is specified in all the cases. In forty-one it took place immediately, in one

soon after, in four the next day, in two on the sixth day, in one on the tenth, in one on the sixteenth, in two on the twenty-eighth, in one on the thirty-third, and in one on the forty-seventh. In the three cases in which there was more than one foreign substance, the expulsion occurred at different periods.

The mode of expulsion is stated in fifty-seven cases. In twenty-six it was by coughing; in one by coughing and vomiting; in one by vomiting; in two by a violent expiratory effort; in one by a spasmodic effort; in two by inversion; in one by coughing and inversion; and in two it was spontaneous. In fourteen the substance was removed with the forceps, in three with the probe, in one with the hook and forceps, and in one by inversion and the forceps. In two, the word "extraction" occurs without designating the manner by which it was effected. In the extraordinary case communicated to me by Dr. John L. Atlee, the probe entered a large abscess, rupturing its walls, and thus allowing its contents to escape, along with the foreign body, in a violent fit of coughing.

In eight of the cases, the offending body was not expelled until after the closure of the wound. It is remarkable that in all of them the symptoms were relieved, either wholly or in part, by the operation, but returned, with all their former severity, as soon as the artificial opening had healed, or, rather, as soon as it had become a good deal contracted. The subjoined tabular arrangement will exhibit this subject in its proper light:—

NO.	FOREIGN BODY.	AGE.	TIME OF EXPULSION.	AUTHORITY.
1.	Grain of corn.	5 years.	28 days.	Dr. B. F. Trabue.
2.	Piece of hazel-nut.	15 years.	28 days.	Dr. D. Johnston.
3.	Nail.	3 years.	33 days.	Dr. C. Jewett.
4.	Water-melon seed.	4 years.	47 days.	Author.
5.	Stopper of an inkstand.	11 years.	2 months.	Dr. Enoch Hale.
6.	Cherry stone.	6 years.	2½ months.	Mr. B. Travers, Jr.
7.	Fiddle-peg.	19 years.	3 months.	Dr. Houston.
8.	Pebble.	3½ years.	3 months.	Mr. W. H. Porter.

In addition to the above cases may be mentioned the following, the history of which is imperfect, though not without interest:—

The first occurred in the practice of Dr. Gilbert,[1] Professor of Surgery in the Pennsylvania College at Philadelphia. A boy, aged six years, while at play, drew a grain of corn into his

[1] American Journal of the Medical Sciences, vol. xxi. p. 74, 1851.

windpipe. The trachea was opened a few days after, and the substance was immediately ejected "by the violent action of the chest in expelling the pent-up air."

The late Dr. William A. McDowell, of Evansville, Indiana, had, as he informed me a short time before his death, a case of successful tracheotomy during his residence at Fincastle, Virginia, in 1827. The patient was a boy, aged eleven years, who had inadvertently drawn a large persimmon-stone into his windpipe, which was forcibly expelled the moment the knife was withdrawn from the wound.

Dr. G. A. Michaelis,[1] of Kiel, tracheotomized a child, aged eleven months, on account of a piece of the kernel of a nut, which was expelled in a fit of coughing, forty-eight hours after the operation. Keyler[2] and Busch[3] have each reported a successful instance for the removal of a bean. Lacatmentis and Lassere[4] give a case in which the operation was performed on account of the presence of a prune-stone, which, however, was not ejected until four days after. A child, aged two years and a half, was lately admitted into the Derby Infirmary, in a pulseless and seemingly asphyxiated condition, from the inhalation of a wedge-shaped piece of hard-boiled beef. Mr. Dix, the house-surgeon, immediately opened the trachea, and, introducing a quill into the wound, quickly succeeded in restoring respiration. The child rallied, and, in a slight paroxysm of coughing, the foreign body was happily ejected, though he came very near dying afterwards from inflammation of the air-passages. Mr. Eddison, of the Nottingham General Hospital, a short time ago, performed a similar operation on account of the impaction of a piece of apple in a child's larynx. The four upper rings of the trachea were divided, and soon afterwards the foreign body was coughed up. The patient did well, and the wound soon healed. It was believed that a second portion of apple had lodged in the right bronchial tube, which, as it was never discharged in mass, was probably ejected, in a softened state, along with the expectorated matter.[5]

[1] Hufeland's Biblioth. der practischen Heilkunde, Bd. lxxv. p. 260, 1836.
[2] Hufeland, *op. cit.*, Bd. lxx. p. 371, 1833.
[3] Hufeland, *op. cit.*, Bd. xliii. p. 286, 1830.
[4] Hufeland, *op. cit.*, Bd. xi. p. 352, 1814.
[5] London Medical Times and Gazette, February 4, 1854.

TABLE OF CASES OF TRACHEOTOMY, FOLLOWED BY THE EXPULSION

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	PREVIOUS TREATMENT.
1	Kidney-bean		20 mos.	Difficult respiration, threatened suffocation, and lividity of the countenance; bean moving up and down trachea.	
2	Bean	Male	2 years	Difficulty of breathing, and fits of coughing, followed by partial insensibility.	Introduction of probang into œsophagus
3	Piece of crystal	Male	5 years	Difficult respiration and constant cough, with a loud noise in the trachea; in an hour breathing became suddenly natural.	
4	Bean	Female	22 mos.	Dyspnœa, and fits of suffocation; probable situation of the offender in the left bronchial tube.	
5	Pebble	Male	3½ years	Violent cough; gasping and stridulous breathing; lividity of the face; probable situation of pebble in right bronchia.	
6	Larynx of a goose	Male	12 years	Great dyspnœa; spasmodic contraction of muscles of the neck; whistling sound in inspiration; hoarseness of voice.	
7	Piece of earthen cup	Male	12½ mos.	Dyspnœa; hoarseness; hissing respiration: dysphagia; offending body in the larynx.	
8	Piece of claw of a lobster	Male	5½ years	Strangling, cough, and severe dyspnœa; stridulous breathing; altered voice; lividity of face.	Repeated emetics
9	Two citron-melon seeds	Male	10 mos.	Ordinary.	
10	Piece of silver tube	Male		No important symptoms for some hours; then breathing became difficult, and attended with a whistling noise; distension of facial veins and clammy sweats.	
11	Pipe-stem	Male	4 years	Incessant coughing and suffocative symptoms, much aggravated next day; painful breathing; great distress near top of sternum.	Sternutatories, and an emetic
12	Bean	Female	4 years	Dyspnœa, and fits of strangulation; hissing and husky noise in breathing; obstruction of the right bronchial tube.	
13	Plum-stone	Female	6 years	Violent cough, and difficulty of breathing; bloody expectoration; whistling sound in respiration, and absence of vesicular murmur in part of the right side.	
14	Bone	Female	12 years	Difficulty of breathing unremitting; no cough after first few seconds; croupy voice; pain and tenderness at lower part of the larynx.	
15	Bean	Female	4 years	Violent and protracted coughing; followed by asthmatic symptoms.	
16	Pebble	Male	4 years	Suffocative symptoms; two hours after, perfectly tranquil, and playing; immediate reproduction of distress when made to cough.	Anodyne expectorants
17	Bean	Male		Strangulation, pain, and retching, which, however, soon passed off; reproduced afterwards with increased violence.	Emetics and inversion
18	Bean	Female	9 years	Convulsive cough, and fits of suffocation, with severe pain beneath the upper part of sternum, increased at each inspiration.	
19	Bean	Female	8 years	Violent cough and dyspnœa, threatening suffocation; alternations of calm and distress; shock of foreign body perceived by the ear at top of sternum.	Emetics

OF THE FOREIGN BODY AND THE RECOVERY OF THE PATIENT.

TIME OF OPERATION.	ACCIDENTS.	TIME AND MODE OF EXPULSION.	OPERATOR.	AUTHORITY.
2 hours		Immediately; with the probe.	Dr. Joseph Palmer	American Med. Recorder, vii. 32, 1824.
2 hours		Immediately; by coughing.	Dr. P. P. Woodbury	New England Journ. Med. and Surg., xiv. 32, 1825.
A few hours	Copious hemorrhage	Immediately; spontaneously.	Robert Liston	Lond. Lancet, i. 545, 1839–40.
5 hours		Immediately; with the forceps.	Dr. Twitchell	New England Quarterly Journ. Med. and Surg. Jan. 1843, p. 305.
Soon after		Upwards of three months; by coughing.	Mr. W. H. Porter	Todd's Cyclopædia Anat. and Phys., iii. 125, Lond. 1847.
18 hours		Immediately; with the forceps.	Dr. Burow	Casper's Wochenschrift; Brit. and For. Medico-Chir. Rev., Jan. 1850, 260.
18 hours		Immediately; with the probe.	Dr. Twitchell	New England Quarterly Journ. Med. and Surg., Jan. 1843, 307.
About 23 hours.		Immediately; with the forceps.	Dr. W. H. Van Buren	Author.
24 hours		One body at once, and the other in a few days; by coughing.	Dr. E. H. Davis	Author.
Day after		Immediately; by violent expiratory effort.	Mr. Travers, Jr.	Chelius's Surgery, by South, iii. 116, Philad. 1847.
Day after		Immediately; with the probe.	Dr. Charles Hall	Amer. Journ. Med. Sciences, N. S., ix. 357.
Day after	Temporary strangulation	Immediately; with the forceps.	Dr. Twitchell	New England Quarterly Journ. Med. and Surg., Jan. 1843, p. 310.
Day after		Soon after; with the forceps.	Dr. J. Reiche	Rust's Mag. für die Gesammte Heilkunde, B. xxvii., 1828.
Day after		Immediately; with the forceps.	Mr. Cæsar Hawkins	Lond. Med. Gazette, xxv. 825.
Day after		Immediately; by coughing.	Dr. Mazier	Annal. de la Med. Physiol., Dec. 1828.
Day after		Immediately; with the forceps.	Dr. W. I. Hunt	Medico-Chirurgical Trans. of London, xxii. 27.
27 hours		Immediately; by coughing.	Dr. M. C. Hoyt	Amer. Journ. Med. Sciences, N. S., xxv. 267, 1853.
36 hours		Next day; with the forceps.	Dr. Gracfe	London Med. Gazette, i. 511.
End of 2d day		Immediately; by violent expiratory efforts.	Dupuytren	Arch. Gén. de Méd., xxii. 405, 1830.

TABLE OF CASES OF TRACHEOTOMY, FOLLOWED BY THE EXPULSION

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	PREVIOUS TREATMENT.
20	Bean	Female	7 years	Suffocative symptoms; great pain in upper part of chest; extreme suffering in attempting a full inspiration; convulsions.	Emetic
21	Grain of corn		4 years	Distressing and prolonged fits of coughing, of a croupy character, with vomiting, dyspnœa, and lividity of face; foreign body moving up and down trachea.	
22	Bean	Male	6 years	Sense of suffocation and slight convulsion, followed by very mild symptoms, and these by very severe.	
23	Shawl-pin	Female	9 months	Fits of coughing and strangling, with intervals of comparative ease till operation.	
24	Button-mould	Male	10 years	Difficulty of breathing, cough, and suffocative sensation, with distress at top of sternum.	Emetic
25	Piece of bean	Female	3 years	Frequent and severe coughing; dyspnœa; bloated and livid state of countenance.	
26	Grain of corn	Male	4 years	Spasmodic coughing; sense of suffocation; lividity of the face; body moving up and down windpipe.	
27	Glass bead	Female	5 years	Distressing cough for two hours, when the child became easier, but the suffering increased much afterwards.	
28	Bean		6 years	Cough, and sense of suffocation, followed by frequent vomiting; complete aphonia; lividity of face; peculiar sounds at base of larynx.	Emetics and leeches, with probang in œsophagus
29	Jawbone of a mackerel		2 years	Violent suffocative cough till operation.	Emetics and other means
30	Grain of corn	Male	5 years	Spasmodic coughing, and fits of suffocation; right lung hardly receiving any air.	
31	Pebble	Male	13 years	Coughing and dyspnœa; body moving up and down trachea, and shifting from one bronchia to the other.	Inversion
32	Water-melon seed	Male	4 years	Coughing, and sense of suffocation, followed by dyspnœa and croupy respiration.	Emetics and errhines
33	Prune-stone	Female	26 years	Violent coughing, and suffocative paroxysms, followed by other distressing symptoms.	Emetics, venesection, anodynes, & expectorants
34	Brass button	Female	6 years	Violent coughing, and sense of suffocation; aphonia; absence of vesicular murmur in both lungs.	
35	Hazel-nut shell	Male	15 years	Suffocative cough, followed by croupy breathing and husky voice; pain in trachea, and a loud, hoarse sound in that tube, both in inspiration and expiration.	
36	Pebble	Male	7 years	Suffocative symptoms, threatening speedy dissolution; coughing; pebble passing up and down trachea.	
37	Bean	Female	3½ years	Mild for some days after first attack; then violent and frequent coughing, with embarrassed breathing.	
38	Acorn	Female		Violent coughing and retching, which, however, soon subsided, but recurred with great severity whenever the acorn changed its situation.	Various means
39	Grain of corn	Female	3 years	Frequent and distressing paroxysms of coughing.	
40	Sheep's tooth	Female	7 years	Suffocative symptoms, tickling cough, and other distress.	

OF THE FOREIGN BODY AND THE RECOVERY OF THE PATIENT.

TIME OF OPERATION.	ACCIDENTS.	TIME AND MODE OF EXPULSION.	OPERATOR.	AUTHORITY.
End of 2d day	Profuse hemorrhage	Next day; with hook and forceps.	Dr. Amasa Trowbridge	New York Med. Repository, xx. 79.
End of 2d day	Hemorrhage	Immediately; by coughing.	Dr. W. Davidson	Western Lancet, May, 1848.
3d day		Immediately; by extraction.	Dr. S. Annan	American Medical Recorder, vii. 42, 1824.
3d night		Immediately; by extraction.	Dr. V. Mott	Author.
End of 3d day		Immediately; by coughing.	Dr. John L. Atlee	American Medical Review, iii. 191, 1826.
End of 3d day	Hemorrhage	At two periods; by coughing.	Dr. Calvin Jewett	New England Journ. Med. and Surg., xiii. 237, 1824.
Several days		Immediately; by coughing.	Dr. J. D. Maxwell	Author.
4th day	Hemorrhage	Immediately; by coughing.	Dr. William Gibbon	Lond. Med. Gaz., xxii. 384.
End of 5th day		Immediately; with the forceps.	Dupuytren	Leçons Orales, iii. 593.
End of 5th day		Immediately; with the forceps.	P. J. Pelletan	Clinique Chirurg., i. 6, Paris, 1810.
5 days		28 days; by coughing.	Dr. B. F. Trabue	Amer. Journ. Med. Sciences, April, 1853.
End of 5th day		Immediately; by inversion.	B. B. Cooper	Lond. Med. Gaz., N. S., v. 303, 1847.
End of 6th day	Profuse venous hemorrhage	Immediately; spontaneously.	Dr. Thomas Wells	Amer. Journ. Med. Sciences, x. 28, 1832.
End of 6th day		10 days; by coughing and vomiting.	Mons. Jobert	L'Union Médicale, No. 68, 1851.
7th day		Immediately; by vomiting.	Author	Author.
7th day		28 days; by coughing.	Mr. David Johnston	London Lancet for 1851, ii. 600.
One week		Immediately; by coughing.	Dr. R. L. Howard	Ohio Med. and Surg. Journ., i. 395, 1849.
8th day		Immediately; by spasmodic effort.	Dr. Zadok Howe	Amer. Journ. Med. Sciences, iii. 347, Philad. 1828.
8th day	Hemorrhage	Immediately; with the forceps.	Dr. F. Wendt	Historia Tracheotomiæ; Vratislaviæ, apud Meyerum, 1774.
8th day		2 days; by extraction.	Dr. J. W. Heustis	New York Med. and Physical Journal, v. 557.
10th day		Immediately; by coughing.	Mr. John Rayner	London Lancet, i. 231, 1848.

TABLE OF CASES OF TRACHEOTOMY, FOLLOWED BY THE EXPULSION

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	PREVIOUS TREATMENT.
41	Nail	Male	3 years	Frequent suffocative cough; hurried breathing; difficulty of lying on the left side; hissing noise in right lung; failure of strength.	
42	Nail	Male	8 years	Ordinary, followed by emaciation.	
43	Water-melon seed and shank of a plum-stem	Male	3 years	Violent and strangling cough; altered voice; whistling sound in breathing: suffering always worse at night.	
44	Brass ring			Occasional cough, attended by a croupy sound, and whistling during sleep.	
45	Cherry stone	Female	6 years	Violent fit of choking; cough; hectic; purulent expectoration.	Bleeding
46	Shingle nail	Male	5 years	Ordinary, followed by occasional dyspnœa, and loud bronchial rhonchus in both lungs.	Emetics and inversion
47	Half sovereign	Male		Violent fit of coughing, choking, and vomiting; mild for some days, and then more severe and denotive of pneumonia; body moving up and down trachea.	Inversion and other means
48	Persimmon seed		4 years	Occasional violent paroxysms of coughing; fever, pulmonary irritation, and loss of strength.	
49	Water-melon seed	Male	4 years	Incipient croupy cough, pneumonia, and gradual exhaustion.	Emetics and venesection
50	Pebble	Male	9 years	Violent coughing and dyspnœa; pain in right side of the chest; peculiar "eliek" in coughing; pneumonia.	Antiphlogisties and inversion
51	Gravel and beans		17 mos.	Violent coughing, followed by extreme debility and emaciation; supposed to have worms.	Anthelmintie medicines
52	Water-melon seed		12 to 14 months	Paroxysms of dyspnœa frequent and urgent; whistling sound in right bronchia; emaciation, and purulent expectoration.	
53	Kernel of a hickory-nut	Male	5 years	Symptoms of suffocation, wheezing respiration, distressing cough, fever and emaciation; abscess in the left lung.	
54	Piece of cocoa-nut	Female	5 months	Cough, dyspnœa, fever, emaciation, and pain in windpipe.	Emetics and other means
55	Grain of coffee	Female	9 months	Ordinary; body moving up and down the windpipe; tracheo-bronchitis.	Emetie and other remedies
56	Water-melon seed		17 mos.	Coughing, and convulsive breathing, followed by excessive pectoral distress, and symptoms of phthisis.	
57	Fiddle-peg	Female	16 years	Frequent paroxysms of coughing, particularly severe at night, and always relieved by drink; croupy breathing, and constant mucous râle.	
58	Stopper of an inkstand	Female	11 years	Mild at first, then more severe, and ultimately followed by violent and frequent cough, copious expectoration, and inability to lie down.	
59	Bone	Female	37 years	Severe coughing; impending suffocation; sharp pain in the larynx; dyspnœa; stridulous breathing.	
60	Water-melon seed	Female	4 years	Cough and dyspnœa; asthmatic breathing, and deformity of the chest.	Emetics and other means

OF THE FOREIGN BODY AND THE RECOVERY OF THE PATIENT.

TIME OF OPERATION.	ACCIDENTS.	TIME AND MODE OF EXPULSION.	OPERATOR.	AUTHORITY.
11th day		33d day; by coughing, at glottis.	Dr. Calvin Jewett	Boston Med. and Surg. Journ., xvi. 88, 1837.
13 days		6 days; by coughing and inversion.	Dr. E. H. Davis	Author.
15th day		Immediately; probably by coughing.	Dr. W. H. Van Buren	Trans. New York Acad. Med., i. 105, 1851.
19th day		Immediately; with the forceps.	Mr. Richardson	London Lancet, i. 247, 1852.
19th day		2½ months; by coughing.	Mr. B. Travers, Jr.	Med.-Chir. Trans. of London, xxiii. 108.
3 weeks		Immediately; with the forceps.	Dr. P. F. Eve	Nashville Journal Med. and Surg., v. 129.
24th day		16th day; by inversion.	Sir B. C. Brodie	Med.-Chir. Trans. of London, xxvi. 286.
4 weeks		Next day; by coughing.	Dr. S. Annan	American Medical Recorder, vii. 43, 1824.
5 weeks		Immediately; probably by coughing, at glottis.	Dr. H. G. Jameson	American Medical Recorder, v. 673.
8th week	Hemorrhage	Immediately; by coughing.	Mr. J. Luke	Lond. Med. Gazette, xxii. 296.
58th day		One body immediately and the others next day.	Dr. Enos Barnes	New York Med. and Physical Journ., vi. 78.
65th day		Immediately.	Dr. J. W. Compton	Author.
10½ weeks		Immediately; by coughing.	Dr. J. L. Atlee	Author.
3 months		6 days; by coughing.	Dr. G. Bushe	New York Medico-Chir. Bulletin, ii. 61, 1832.
3½ months		Immediately; by coughing.	Dr. J. L. Atlee	Author.
3½ months	Copious hemorrhage; syncope	Immediately; by inversion and the forceps.	Dr. H. S. Waterhouse	Philad. Journ. Med. and Phys. Sciences, viii. 391, 1824.
4 months		3 months; by coughing.	Dr. Houston	Dublin Med. Journ., xxv. 532, 1844.
6 months		2 months; by coughing.	Dr. Enoch Hale	Dr. J. B. S. Jackson's Catalogue of Museum of Boston Society for Med. Improvement, p. 118, 1847.
6½ months		Immediately; with the forceps.	Robert Liston	Dr. J. Duncan, London Lancet, ii. 419, 1833–34.
7 months		47 days; by coughing.	Author	Author.

NARRATIVE OF CASES OF TRACHEOTOMY, FOLLOWED BY THE EXPULSION OF THE FOREIGN BODY AND THE RECOVERY OF THE PATIENT.

CASE 1.—*Large kidney-bean; child, aged twenty months; urgent symptoms; body playing up and down the windpipe; tracheotomy two hours after the accident; extraction of the substance with a probe; recovery.* (Dr. Joseph Palmer, Amer. Med. Recorder, vol. vii. p. 32, 1829.)

A healthy, fleshy child, aged twenty months, whilst in the act of crying, was seized with choking, which was so severe that for several minutes its life was despaired of. At the time of the accident it had beans in its hands, one of which was supposed to have descended into the trachea. Soon after, when seen by Dr. Palmer, the lips were lived, the countenance flushed, and the respiration so difficult, and, at intervals, so alarming, as to threaten immediate suffocation. Tracheotomy was performed two hours after the accident; the incision in the tube was more than an inch in length; and the bean, which was of the largest size, and moved up and down the trachea in respiration, was easily extracted with a flat probe. The wound was closed by the interrupted suture. Three days after the operation, symptoms of tracheitis appeared, for the relief of which the child was bled and purged, after which it gradually recovered.

CASE 2.—*Bean; boy, aged two years; dyspnœa, coughing, and partial insensibility; tracheotomy at the end of about two hours; tube opened first transversely, and then longitudinally; expulsion of the substance in a violent fit of coughing; recovery.* (Dr. Peter P. Woodbury, New England Journ. Med. and Surgery, vol. xiv. p. 32, 1825.)

Rufus Merril, aged two years, inhaled a bean on the 26th of March, 1822, and was immediately after seized with difficulty of breathing and paroxysms of coughing. When Dr. Woodbury saw him, a short time after, he was so fully convinced that the obstruction existed in the œsophagus that he was induced to pass a probang, but after repeating the introduction several times, he became satisfied that he was mistaken, and, therefore, without any further delay performed tracheotomy. The child by this time was nearly insensible. The trachea was opened transversely, but finding that the wound did not afford sufficient space, he divided the first car-

tilaginous ring above the incision, when the air rushed into the lungs with great force. He then introduced a female catheter, and brought it out at the mouth, without, apparently, encountering the foreign body. An examination with the finger resulted in no better luck. He was about to make further search, when the child coughed with considerable violence, and ejected a bean from the mouth to some distance. It had been in the windpipe only about two hours, and was a white one of the largest size. No blood was lost in the operation; and the child recovered in a very short time.

Case 3.—*Piece of crystal; boy, aged five years; symptoms violent at first, but very mild afterwards; tracheotomy a few hours after the accident; immediate expulsion of the offending substance; copious hemorrhage; violent pneumonia after operation; recovery.* (Mr. Robert Liston, London Lancet, vol. i. p. 545, 1839–40.)

A little boy, five years of age, was admitted into University College Hospital, under the care of Mr. Liston, on the 2d of November, on account of having inhaled, half an hour previously, a piece of rock crystal, cut for setting in a seal. The breathing was difficult, and was accompanied by a constant cough. There was a loud sound in the trachea, and the application of the stethoscope to the throat gave the idea of something being suspended in that tube, which retreated again at each expiration. The symptoms continued for about an hour after the admission of the child, when the breathing became suddenly natural. A loud sonorous rattle, however, was heard opposite the division of the trachea, and the respiration was rough and noisy in the upper part of each lung. Tracheotomy being determined upon, Mr. Liston made an incision, an inch and a half in length, and reaching to within six lines of the sternum. Great hemorrhage took place from a divided vein, and so obscured the parts that it was some time before the tube could be opened, the bleeding being much increased by the violent cries of the child. A hook was passed between the rings of the trachea, which was pulled forward and divided, notwithstanding the flow of blood.

The child was then placed with its head downwards, and began to expire through the opening in the trachea. Shortly afterwards the foreign body was expelled through the wound, and proved to be a roundish piece of glass, about the volume of the little finger.

The child soon ceased to breathe through the artificial opening, and sank into a tranquil sleep. Warm-water dressing was, therefore, applied to the neck, and continued until the parts were nearly healed.

Symptoms of pneumonia having come on soon after the operation, six leeches were applied to the chest, and two grains of calomel given every two hours. The child had a tranquil night, but the pulse remained at one hundred and forty. During the day, it rose to one hundred and fifty; there was great dryness of the skin, some fetor of the breath, and considerable thirst. Six more leeches were applied, and ipecacuanha and tartar emetic given internally, in small doses every two hours. Subsequently, the pulse rose to one hundred and eighty; and all the symptoms becoming aggravated, the child was bled at the arm to nine ounces, and cupped on the back to four ounces; the bowels were freely moved, and the nauseants were continued. The bad symptoms gradually subsided, and soon after the middle of November the boy was discharged from the hospital.

Case 4.—*Bean; girl, aged twenty-two months; dyspnœa and fits of suffocation; probable situation of the substance in the left bronchial tube; tracheotomy about five hours after the accident; extraction with the forceps; recovery.* (Dr. Twitchell, New England Quarterly Journ. of Med. and Surg., for January, 1843, p. 305.)

The bean, in this case, slipped into the windpipe while the child was in the act of laughing. She was immediately seized with difficulty of breathing, and occasional paroxysms of suffocation. As the left lung did not expand in respiration, it was concluded that the foreign body was lodged in the corresponding bronchial tube. It was evident, however, from the symptoms which ensued soon after, such as the excessive jactitation, lividity of the countenance, and the gasping character of the breathing, that it was occasionally impelled up and down the trachea, thereby threatening strangulation. About five hours had elapsed since the occurrence of the accident. An operation was now determined upon, and immediately performed in the usual manner. Some small vessels were divided, but did not require a ligature, and the thymus gland was found to mount as high up as the thyroid body; an arrangement which compelled Dr. Twitchell to have them held out of the way during the division of the trachea. It having been satisfactorily ascertained

that the bean was not in the larynx, a pair of common dressing forceps was introduced into the tube, to separate the edges of the wound. They had scarcely been placed in this situation, when the offending substance, during some little struggle of the child, came up, and was instantly seized and extracted. The respiration immediately became easy and natural; the wound was dressed with adhesive strips; and, in a week, the child was in perfect health.

Case 5.—*Pebble; boy, aged three years and a half; probable situation in the right bronchial tube; violent symptoms; tracheotomy soon after the accident; expulsion of the foreign body upwards of three months after the operation; reopening of the wound; recovery.* (Mr. W. H. Porter, Todd's Cyclopædia of Anatomy and Physiology, vol. iii. p. 125. London, 1847.)

On the 13th of September, 1839, a child, aged three years and a half, was brought to the Meath Hospital, at Dublin, in consequence of violent suffering, caused, half an hour previously, by inhaling a small stone. He had been instantly seized with a severe cough, which continued up to the moment of his admission, and which was attended with hurried, gasping, and stridulous breathing, lividity of the face and lips, and an expression indicative of great distress. The left side of the chest heaved violently, and the respiration in the corresponding lung was loud and puerile; the right side, on the contrary, was comparatively quiet, and the breathing very weak and interrupted. No dulness on percussion was anywhere perceptible in the chest.

Mr. Porter performed the operation of tracheotomy, but no foreign body was expelled, although the little patient experienced the greatest relief. As the windpipe was too small to admit of the introduction of any instrument for the extraction of the stone, this distinguished surgeon contented himself with keeping the wound open, in the hope of its being ejected. It was noticed that whenever, from any accident, the artificial aperture became obstructed, the child breathed with infinite difficulty, but that he obtained instant relief when its edges were separated and cleaned. Such were the phenomena of the case generally, up to the 6th of October, when it was found that the wound had gradually closed and healed so as to leave the artificial opening very small; and on that day, in consequence of the increased difficulty of breathing, Mr. Porter was obliged to enlarge

the wound to its original dimensions. This second operation afforded immediate relief. On the 6th of December, the wound being again nearly healed, in a desperate fit of coughing, the child expelled a small stone, about half an inch long by two lines broad, through the rima of the glottis.

Mr. Porter adduces this case to show that the difficulty of breathing which rendered the operation necessary was occasioned, not by the mechanical obstruction of the windpipe, but by spasm of the larynx. The child, it appears, had always repose when not called upon to employ the rima in respiration, although the stone was present in one or other of the bronchial tubes; and he adds, what is particularly worthy of remark, that in this case it shifted its position, as proved by stethoscopic evidence.

Case 6.—*Larynx of a goose; boy, aged twelve years; great dyspnœa; whistling noise in breathing; hoarseness of the voice; tracheotomy eighteen hours after the accident; extraction with the forceps; recovery.* (Dr. Burow, Casper's Wochenschrift, as quoted in British and Foreign Medico-Chir. Rev., Jan. 1850, p. 260.)

A lad, aged twelve years, while amusing himself in blowing through the larynx of a recently-killed goose, was seized with a cough, in which he swallowed the substance in question. A sense of suffocation immediately ensued, which was, after a time, replaced by great dyspnœa. When Dr. Burow saw him, eighteen hours after the accident, his face was swollen, of a bluish-red color, and covered with perspiration. At every inspiration the muscles of the neck contracted spasmodically, and a clear whistling sound was heard, followed at each expiration by a hoarse noise, not very unlike the voice of a goose. The rima of the glottis being found obstructed, Dr. Burow felt convinced that the larynx of the goose had passed through it, and thus occasioned all the embarrassment. Tracheotomy was at once performed, but owing to the homogeneousness of the structure of the foreign body and of the parts with which it was in contact, the greatest difficulty was experienced in seizing it with the forceps. Moreover, so sensitive was the mucous membrane that, the moment an instrument touched it, violent efforts at vomiting were produced, and the entire larynx of the patient was drawn up behind the root of the tongue. At last, after repeated attempts, Dr. Burow, having fixed the larynx in the neck by his forefinger, so that it could no longer be drawn up on these occasions, contrived to

remove the entire larynx of the bird. The child was quite well by the ninth day.

The above case, incredible as it appears, is well authenticated. It would seem that the children in Dr. Burow's neighborhood are very fond of blowing through the larynx of a recently-killed goose, in order to imitate the sound emitted by that bird. When prepared for this purpose, it has usually ten or a dozen of the rings of the trachea connected with it.

CASE 7.—*Piece of earthen cup; boy, aged one year and sixteen days; dyspnœa, hoarseness, hissing respiration, and difficulty of swallowing; lodgement of the intruder in the larynx; tracheotomy eighteen hours after the accident; extraction with the probe; recovery.* (Dr. Twitchell, New England Quarterly Journ. of Med. and Surg., Jan. 1843, p. 730.)

A boy, aged twelve months and a half, affected with catarrh, drew into his larynx, in the act of coughing, a piece of earthen cup. The ordinary symptoms immediately ensued; the breathing was hoarse and hissing, and the child was unable to swallow. A probang having been passed into the œsophagus, the respiration became somewhat relieved, and the dysphagia entirely disappeared. Next morning, there was a decided aggravation of the suffering; the face was livid, the voice husky and hissing, the breathing gasping. Tracheotomy was performed eighteen hours after the accident; some delay was occasioned by arterial hemorrhage, but this soon ceased, and the tube was then divided to the extent of half an inch. After waiting a little to enable the child to recover from its exhaustion, a pair of small forceps was carried up into the larynx, where it came immediately in contact with the foreign substance, but could not dislodge it. A large probe was then passed, and the substance forcibly pushed into the fauces, whence it was swallowed. The wound was kept open, and the case treated antiphlogistically. Severe inflammation of the larynx supervened, causing excessive embarrassment in breathing, with complete aphonia, and high febrile excitement. During the progress of the case, Dr. Twitchell was obliged to dilate the wound in the trachea with a bougie, in order to promote respiration. Gradually, the little patient began to improve, and in a month he was entirely restored.

CASE 8.—*Piece of the claw of a lobster; boy, aged five years and a half; croupy symptoms; repeated emetics; tracheotomy near the end of the first day; chloroform; extraction with the forceps; recovery.* (Communicated to the author by Dr. W. H. Van Buren, of New York.)

On the 3d of August, 1853, at about 8 o'clock in the evening, a healthy boy, five years and a half old, was nibbling at a piece of the claw of a lobster, at the same time that he was sobbing, when he was suddenly seized with strangling, cough, and severe dyspnœa. Supposing that he had croup, he was repeatedly vomited, and also blistered. No relief being obtained, he was brought to New York from Stonington, Connecticut, Dr. Van Buren seeing him within half an hour after his arrival. The face was dusky, the breathing stridulous, the respiratory murmur faint, the cough frequent and croupy, and the voice altered. The throat was unobstructed, and the respiration was equal on both sides.

Chloroform having been administered, the trachea was opened without delay about twenty-one hours after the accident. A pair of forceps being passed upwards struck the foreign body, which was immediately seized, but not removed without some force. It proved to be a fragment of the claw of a lobster, which had evidently been fixed transversely across the larynx, probably with one extremity in each ventricle. The wound was partially closed by sutures. Immediate relief followed, and the child recovered perfectly in about sixteen days, without accident or interruption.

CASE 9.—*Two citron-melon seeds; male, aged ten months; ordinary symptoms; tracheotomy twenty-four hours after the accident, followed by the immediate ejection of one of the extraneous substances; expulsion of the other at the end of some days; recovery.* (Communicated to the author by Professor E. H. Davis, M. D., of New York.)

In the month of June, 1841, a son of Mr. James Hughes, of Jackson County, Ohio, aged ten months, while playing with some citron-melon seeds drew two of them into his windpipe. Dr. Davis saw him twenty-four hours after the accident, when he was suffering from paroxysms of suffocation with intervals of ease. The symptoms being urgent, an operation was at once determined upon and performed. The moment the trachea was incised, a fit of coughing ensued, in which one of the seeds was ejected through the opening in the neck. As the child seemed to be perfectly comfort-

able, the wound was dressed, and the case left in the care of the family physician, no one supposing that another seed remained in the air-passages. Next day, however, Dr. Davis received a letter, stating that the paroxysms of dyspnœa had returned, and that the sufferings were very similar to those which preceded the operation. The paroxysms continued to recur several times in the twenty-four hours for some days, when at length the child coughed up a second melon-seed, and from that time rapidly recovered.

Case 10.—*Piece of silver tube; man; whistling noise in breathing; enlargement of the former opening in the windpipe on the day of the accident; expulsion of the foreign body in a fit of coughing; recovery.* (Mr. South, Chelius's Surgery, vol. iii. p. 116. Phila. 1847.)

The subject of this case entered St. Thomas's Hospital, London, in December, 1844. A silver tube had been introduced about two years and a half previously, and on the morning of his admission, as he was walking along the street, it slipped out broken. No symptoms, however, of consequence appeared till towards evening, when the breathing became difficult, and attended with a whistling noise; the veins of the head and face were distended, and the surface was covered with cold perspiration. Mr. Travers, the younger, being sent for, thought it necessary to pare the edges of the opening, and dilate it upwards and downwards upon a director. Some blood running into the windpipe caused violent expirations, in one of which two fragments, forming the remainder of the canula, were expelled. The relief was immediate. Another canula was introduced, and the patient did well.

Case 11.—*Pipe-stem; boy, aged four years; fruitless employment of sternutatories and emetics; tracheotomy the day after the accident; withdrawal of the foreign body with a probe; recovery.* (Dr. Charles Hall, Amer. Journ. Med. Sciences, N. S. vol. ix. p. 357.)

A boy, aged four years, sucked a piece of pipe-stem, one inch and three quarters in length, into his windpipe, while he was holding it between his lips, drawing air through it. Incessant coughing and suffocative symptoms immediately followed. Sternutatories and an emetic were administered, but with no good effect. The next morning the symptoms were much aggravated. Every respiration was now performed with painful effort; the irritation was so concentrated that the little sufferer was enabled to place his

finger over the spot where the foreign body seemed to be lodged, that is, near the top of the sternum on the right side. The trachea was now opened, and as the pipe-stem did not appear, search was made for it with a probe, passed in the direction of the right bronchial tube; after some minutes the point of the instrument entered the canal of the foreign substance, which was thus drawn up and extracted. The difficulty of breathing continued for several days after the operation; but the recovery was speedy and complete.

Case 12.—*Bean; girl, aged four years and four months; dyspnœa and attacks of suffocation; hissing and husky noise in breathing; obstruction of the right bronchial tube; tracheotomy the day after the accident; difficulty in effecting extraction; temporary strangulation; recovery.* (Dr. Twitchell, New England Quarterly Journal of Med. and Surgery, January, 1843, p. 310.)

The symptoms which immediately succeeded the intrusion of the bean, in this case, were difficulty of breathing and occasional violent suffocative paroxysms. The respiration soon after became hissing and husky, and auscultation rendered it probable that the offending body was lodged in the right bronchial tube. Tracheotomy was performed the morning after the accident. The incision in the trachea was somewhat more than half an inch in length. The bean almost immediately made its appearance, presenting its flat surface at the wound, which was too small, however, to permit its egress. In endeavoring to seize it with the forceps, it slipped from the grasp of the instrument, and was forced up into the larynx, which it so completely filled as to arrest the passage of the air. An attempt was now made to dislodge the bean with a large probe, but without success; the assistants who held the edges of the wound asunder lost their hold, and in an instant the child ceased to breathe from the closure of the opening by the integuments of the neck. A bougie was immediately introduced into the trachea towards the lungs, while a person compressed the chest in different directions with his hands. The instrument caused some irritation, and on withdrawing it a little air seemed to rush into the lungs. Respiration was gradually restored, and the bean finally extracted with a pair of forceps passed up into the larynx. The wound, dressed with adhesive plaster, healed almost entirely by the first intention. Considerable febrile excitement, with croupy

breathing, supervened, for the removal of which cathartics and antimonials were ordered.

Case 13.—*Plum-stone; girl, six years old; violent cough, strangulation, and absence of vesicular murmur in the right lung; tracheotomy the day after the accident; extraction of the foreign body with a pair of forceps; recovery.* (Dr. J. Reiche, Rust's Magazin für die gesammte Heilkunde, B. 27, 1828; Johnson's Medico-Chir. Rev., N. S., vol. x. p. 518. New York, 1829.)

The subject of this case was a girl, aged six years, who, having swallowed a plum-stone, was instantly seized with a paroxysm of suffocation, which recurred from time to time, accompanied with violent cough and expectoration, streaked with blood. She was seen next day by Dr. Reiche, who discovered a whistling sound during respiration, a frequent cough, and a want of vesicular murmur on the right side, between the second and third costal cartilages. The trachea was opened from the second to the sixth ring, but the foreign body could not be found. The introduction of an oiled probe into the wound occasioned such pain that it was discontinued, and the patient conveyed to bed. In the course of half an hour, however, fresh attempts were made to discover and extract the stone, which were at length successful, the substance being removed with a pair of common forceps. The wound was a considerable time in healing, but the little patient ultimately did well.

Case 14.—*Piece of bone; girl, aged twelve years; peculiar symptoms; tracheotomy the day after the accident; extraction of the foreign body with the forceps; recovery.* (Mr. Cæsar Hawkins, London Medical Gazette, vol. xxv. p. 825.)

A young lady, twelve years of age, was suddenly seized, while taking some soup, with violent vomiting, and suffocative cough, which lasted for an hour, and then left her with a noise in breathing, and a fixed pain beneath the cricoid cartilage. When Mr. Hawkins saw her, she was breathing without labor, but with a croupy sound, and complained of tenderness, referred chiefly to the lower part of the larynx. She could swallow without difficulty. On the day after the accident, as the symptoms continued unabated, an opening was made into the trachea below the thyroid gland, and the patient was desired to cough repeatedly, in the hope that the body might be ejected, but without avail. Feeling the substance

fixed just above the wound, the operator seized it with a pair of forceps, and found it to be a portion of the cervical vertebra of a sheep, nearly half an inch long. The voice was perfectly restored in a few hours, and the patient recovered.

The difficulty of breathing in this case was unremitting; no noise could be heard by the striking of the foreign body against the vocal cords; the feverish excitement was considerable; there was absolutely no cough whatever after the first few seconds; and, instead of the noise in breathing occurring chiefly during inspiration, it was heard, on the day of the accident, only in expiration, while on the following day it was equally audible, both in inspiration and expiration. Mr. Hawkins states that he has examined the records of from seventy to eighty cases of foreign bodies in the air-passages, and that he has been able to find only one presenting similar symptoms to those which characterized the instance now related.

Case 15.—*Bean; girl, aged four years; violent cough and asthmatic breathing; tracheotomy the day after the accident; removal of the foreign substance; recovery.* (Dr. Mazier, Annal. de la Méd. Physiol. Dec. 1828; North Amer. Med. and Surg. Journ. vol. viii. p. 214.)

A girl, four years of age, having a number of beans in her mouth, inadvertently allowed several of them to pass into the throat. A violent and protracted cough immediately ensued, during which two of the beans were ejected. The respiration, however, remained much embarrassed, resembling that of an asthmatic. On the following morning, the little patient was visited by Dr. Mazier, who felt assured that there was a foreign body in the windpipe, and proceeded without delay to open that tube. Having exposed the trachea, he divided four of its rings, but finding that this did not afford him sufficient room, he cut two more, when he separated the edges of the wound with a pair of forceps, in expectation of seeing the foreign body. In this, however, he was disappointed. To provoke coughing, he then tickled the mucous membrane of the tube with a probe, and after having repeated this process several times, the bean appeared at the artificial aperture, from which it was easily removed. Having satisfied himself that the air-passages were entirely free, he closed the wound, which united by the first intention, and the child was perfectly well in ten days.

Case 16.—*Pebble; boy, four years old; cough, and suffocative symptoms; tracheotomy the day after the accident; extraction of the foreign body with the forceps; pneumonia; recovery.* (Dr. William I. Hunt, Medico-Chir. Trans. of London, vol. xii. p. 27.)

A boy, four years old, with a short, fat neck, fell with several pebbles in his mouth, one of which stuck in the rima of the glottis, nearly occasioning suffocation. A lady, who happened to be present, instantly introduced her finger into the mouth, where she felt the stone, which she accidentally forced into the trachea in her attempt to remove it. Two hours after the boy was tranquil, and playing with his toys, with easy breathing. Upon being made to cough, however, he was immediately seized with symptoms of suffocation, attended with wheezing and rattling in the throat. The pebble being small, it returned to the bottom of the windpipe, followed by quiet and easy respiration. Under the influence of an anodyne expectorant the child passed a good night, but during the course of the next day, the foreign body was often forced up by the cough so near the grasp of the glottis that there was frequent danger of suffocation.

An operation was at once decided on. An incision, very little more than half an inch long, and beginning just below the ring of the cricoid cartilage, was made into the trachea, where Mr. Hunt felt the pebble with the point of his knife, and immediately fixed it with the left index finger, to prevent it from being drawn out of his reach by an inspiration. With a pair of forceps an assistant then extracted it. It was of the shape of a kidney-bean, six lines long, by about five in width, and three in thickness. Violent pneumonia succeeded, from which the child was rescued only by the most active treatment, such as repeated venesection, purgatives, blisters, and expectorants.

Case 17.—*Bean; boy; unsuccessful trial of emetics and inversion of the body; tracheotomy twenty-seven hours after the accident; immediate ejection of the foreign substance; recovery.* (Dr. Moses C. Hoyt, Amer. Journ. Med. Sciences, N. S., vol. xxv. p. 267, 1853.)

On the 15th of May, 1852, a boy, while playing with some white beans, allowed one to slip into the trachea. He was immediately seized with symptoms of strangulation, pain, and retching, which, however, soon passed off. When Dr. Hoyt arrived, an hour after

the accident, he was informed that the child had been suspended by the heels, and that an attempt had been made to excite vomiting by titillating the fauces with a feather. The suffering shortly afterwards returned, and upon applying the ear to the chest a harsh blowing sound was distinctly heard opposite the bifurcation of the trachea. An emetic of sulphate of copper and ipecacuanha was now prescribed, and during the action of this the head and shoulders were held in a dependent position. No other effect followed than the evacuation of a large quantity of unmasticated food. The child was now secured to a frame, after the manner of Mr. Brunel, as detailed by Sir Benjamin C. Brodie, for the purpose of suddenly depressing the head by raising the heels. This was repeated a number of times, but was at length obliged to be discontinued, as the bean, in its passage upwards towards the larynx, came very near suffocating the patient. Tracheotomy was then proposed, as a last resort, but the parents violently opposed it, and the consequence was that it was not performed until next day at ten o'clock, twenty-seven hours after the accident. The boy had passed an uncomfortable night, with great pain and dyspnœa, and at the time of the operation he was almost moribund, the respiration being very rapid and stertorous, the features collapsed, and the surface cold and clammy. A gurgling noise was heard in the larynx, similar to that of croup, or like that produced by air forcing its way through mucus; the face was purple, the pulse could hardly be felt at the wrist, and at intervals the child gasped for breath. The external incision was nearly four inches in length, reaching from the cricoid cartilage to the sternum; a small vessel having been tied, the trachea was opened about one inch below the larynx. A pair of curved forceps being introduced, a paroxysm of coughing ensued, during which the bean was forcibly expelled through the artificial aperture to a distance of more than three feet. This was instantly followed by the discharge of at least a tablespoonful of mucus. All the bad symptoms immediately vanished, the respiration and complexion becoming natural. The wound was closed in the usual manner, and the child recovered without a single unfavorable symptom. The bean, which had been detained twenty-seven hours, had become very much swollen, and was fully half an inch long, and large in proportion; the cortex was soft and unbroken, but was easily ruptured by slight pressure.

Case 18.—*Bean; girl, aged nine years; tracheotomy thirty-six hours after the accident; extraction with the forceps; recovery.* (Dr. Graefe, London Med. Gazette, vol. i. p. 511; Amer. Journ. Med. Sciences, vol. ii. p. 456, 1828.)

A girl, aged nine years, holding a large bean in her mouth, allowed it, in a fit of laughing, to enter the trachea, where it excited, at intervals, a convulsive cough, which continually increased in violence. Thirty-six hours after the accident, she had fits of suffocation, alternating with attacks of exhaustion, and there was a severe pain beneath the upper part of the sternum, increased at each inspiration. An incision, one inch in length, was made into the inferior portion of the trachea, followed by the escape of a quantity of bloody mucus, and the relief of the urgent symptoms. Attempts were made, but without success, to discover the bean, first, with a probe, and afterwards with a pair of straight forceps; they invariably produced a violent attack of suffocation, attended with universal spasm. Under the influence of bleeding and a dose of opium, the patient spent a tolerable night; but next day the attacks of suffocation returned with so much violence as to endanger her life. The incision was, therefore, prolonged nearly to the upper edge of the sternum, and another effort made to pass a small pair of forceps into the bronchial tubes; but it caused a recurrence of the spasms and a convulsive cough, during which the epidermis of the bean became visible, but which disappeared instantly before it could be laid hold of. It again showed itself, however, and was extracted; its length being nine lines and its width four and a half. All the bad symptoms disappeared, and in a month the wound was healed.

Case 19.—*Bean; girl, eight years old; fruitless trial of emetics; tracheotomy towards the end of the second day; immediate ejection of the substance; preservation of the voice after the operation; violent bronchitis; recovery.* (M. Dupuytren, Leçons Orales, t. iii. p. 586; Paris, 1833.)

A girl, eight years old, having swallowed a bean, was immediately afterwards seized with violent cough and dyspnœa, approaching suffocation. A practitioner being called in, administered an emetic, which had the effect of producing vomiting, but did not dislodge the foreign body, which was, therefore, supposed to have descended into the trachea. The night and following day were spent in alternations of calm and suffocation. Two days after the accident the child was taken to the Hôtel Dieu. During the night

the paroxysms frequently recurred with frightful intensity. In the morning, at his visit, Dupuytren heard the shock of the foreign substance in the trachea, a species of trembling movement, which was perceived with the greatest facility on applying the ear to the top of the sternum, or even by simply listening to the respiratory sounds. The efforts at coughing were violent, and were accompanied by nausea and by vomiting of frothy matter. Dupuytren without delay opened the trachea, dividing several of its rings with a straight, sharp-pointed bistoury. The edges of the wound were then held asunder by a pair of forceps, when, after several violent expiratory efforts, the bean, enveloped in bloody mucus, was forcibly expelled through the artificial aperture, and fell upon the child's breast. Being a little swollen by the moisture of the parts, it was more than five lines in length, by three lines in breadth, and three lines in thickness. It is stated that the child screamed a great deal during the operation, and that she retained her voice after the air had begun to escape at the wound. Towards evening violent symptoms of bronchitis came on, requiring the abstraction of a pint of blood, and followed by a restless night. Next day the patient had still paroxysms of dyspnœa, the breathing being performed almost entirely through the wound, and accompanied by a mucous rattle. In the evening eight leeches were applied to the neck; they bled very freely, and she was somewhat relieved. The health now gradually improved, and in a short time she was considered out of danger. A month after the operation, however, when Dupuytren saw her again, there was a small aperture at the site of the wound, giving vent to a little air.

Case 20.—*Bean; girl, aged seven years; tracheotomy at the end of the second day; division of the left subclavian vein, followed by profuse hemorrhage; extraction of the foreign body with a hook and forceps two days after the operation; recovery.* (Dr. Amasa Trowbridge, Medical Repository, vol. xx. p. 79.)

Mary Ann Dean, aged seven years, on the 15th of November, 1818, accidentally drew into the trachea a large dried bean. Suffocative symptoms immediately ensued, and a neighboring physician, who saw her soon after the occurrence, believed her to be dying. An emetic of ipecacuanha was prescribed, with the effect of clearing out the stomach and throwing up a bean. The child becoming relieved, it was supposed that the foreign substance had been ejected

from the windpipe in the act of vomiting. Nine hours after the accident, Dr. Trowbridge found the little patient complaining of great pain at the upper part of the chest, with a constant disposition to cough, extreme suffering whenever she attempted to take a full breath, and rattling in the throat. The next evening at six o'clock, he was informed that the child had had several paroxysms of severe distress and the most urgent symptoms of suffocation, attended with convulsions. On the following morning, an incision was made into the trachea, beginning near the cricoid cartilage, and extending two inches down the neck. A profuse bleeding was occasioned by a wound of the left subclavian vein, which passed obliquely across the tube, and required two ligatures. Three rings of the trachea being divided, the respiration became immediately easy, but as the bean did not show itself, the edges of the wound were separated by a "steel distender," which afforded an opportunity for inspecting the cavity of the windpipe, and introducing instruments for extracting the foreign body. No success attended the effort, and nothing further was done until the next day, the 19th. The patient was now very feeble, and there was great dyspnœa, with rattling in the throat, and lividity of the features. Believing that the bean was lodged in the left bronchial tube, Dr. Trowbridge bent a silver wire, twelve inches long, into a hook, and introduced it into the lower extremity of the trachea. Suddenly turning the hook from right to left he drew it up, and with it the bean, which, however, slipped from the instrument before it reached the opening. Laying aside the hook, he passed down a pair of forceps, seizing and bringing up the intruder. The urgent symptoms immediately disappeared, the wound united by the first intention, and a rapid recovery was the result. Dr. Trowbridge, in some remarks appended to this case, speaks of the great advantages of the "steel distender," and of the vertical over the horizontal incision.

Case 21.—*Grain of corn; child, aged four years; distressing and croupy cough, dyspnœa, and lividity of the face; tracheotomy at the end of two days, the patient being under the influence of chloroform; immediate expulsion of the foreign body; recovery.* (Dr. William Davidson, Western Lancet, May, 1848; Amer. Journ. Med. Sciences, N. S., vol. xvi. p. 263.)

The subject of this case was a child, four years of age. Half an hour after the grain of corn had slipped into the windpipe, the fol-

lowing symptoms were present: distressing and prolonged paroxysms of cough, attended with emesis, and resembling croup in its character; deep and laborious inspiration; a livid state of the countenance, and a slightly accelerated pulse. The child slept well during the succeeding night, and the next morning his condition was much ameliorated. The following day, however, every symptom became much aggravated; the cough was incessant; the inspiration painful and difficult; the features sunken, and of a leaden hue; and the whole body bathed in a cold clammy perspiration. The foreign substance could now, for the first time, be distinctly heard moving up and down the trachea during respiration. Tracheotomy being determined upon, thirty drops of chloroform were inhaled from a handkerchief, with the effect of producing unconsciousness in less than a minute. In consequence of a considerable venous hemorrhage, half an hour elapsed before an opening could be made into the tube. Four rings of the trachea were then divided, when, upon the first expiration, attended by a cough, a large-sized grain of maize, which already showed signs of germination, was immediately ejected with considerable force. The edges of the wound were approximated with adhesive strips; and the child recovered without any untoward symptoms. The influence of the chloroform was maintained from the commencement to the close of the operation.

Case 22.—*Kidney-bean; boy, aged six years; cough and dyspnœa; tracheotomy on the third day; immediate extraction of the foreign body; recovery.* (Dr. S. Annan, Amer. Med. Recorder, vol. vii. p. 42, 1824.)

A boy, aged about six years, playing with some dry kidney-beans, put one of them into his mouth, and jumping across a fence, allowed it to slip into the windpipe. A sense of suffocation and a slight convulsion immediately succeeded, but soon disappeared, leaving a trifling cough, which also soon subsided. During the next two days the suffering was so slight that it was deemed advisable to delay the operation of tracheotomy. At the end of the third day, however, there was great difficulty of breathing, threatening instant suffocation, with violent cough, each paroxysm of which was attended with convulsive tremors, and lividity of the countenance. The operation was now performed, and the bean extracted without difficulty. The relief was instantaneous, and the recovery complete.

Case 23.—*Shawl-pin; girl, nine months old; cough and strangling; tracheotomy on the third night; immediate extraction; recovery.* (Communicated to the Author by Dr. W. H. Van Buren, of New York.)

A female child, aged nine months, was suddenly seized with fits of coughing and strangling while in her nurse's arms. No cause could be assigned for so unexpected and severe an illness. Professor Mott being called soon after the occurrence, diagnosticated the presence of a foreign body in the windpipe. The paroxysms of suffering continued undiminished, with intervals of comparative ease, until the third night, when, suffocation momentarily threatening, the trachea was opened in the usual manner, and a portion of what seemed to be a large needle immediately recognized, fixed opposite the wound. It was removed without difficulty, and proved to be a shawl-pin, two inches long, and similar to another in use at the time by the infant's nurse. The point of the pin was fixed in the larynx, while the head, which was composed of glass, and nearly as large as a small marble, looked downwards. No dressing was applied to the wound. The child made a rapid and perfect recovery.

Case 24.—*Button-mould; boy, aged ten years; cough and strangulation; emetic; tracheotomy at the end of the third day; expulsion of the foreign body immediately after; recovery.* (Dr. John L. Atlee, Amer. Med. Review, vol. iii. p. 191. 1826.)

A boy, aged ten years, while running, put a button-mould into his mouth, which, during inspiration, was drawn into his trachea. He complained of difficulty of breathing, attended with a slight rattling in the chest, and pointed to the depression at the top of the sternum as the situation of the foreign body. Upon being requested to cough, the mould ascended against the glottis, producing a sense of suffocation, and requiring a sudden and violent effort at inspiration to remove it. An emetic was given, but without any benefit. During the succeeding night, he had several severe paroxysms of coughing, which almost amounted to suffocation, with great anxiety and alarm. Finding that further delay might prove fatal, tracheotomy was performed at the end of the third day, the incision in the tube being about three-quarters of an inch in length. The edges of the deep wound being held apart, the boy was requested to cough, which he did violently several times, but in vain. The wound was now shut up, and the patient made to repeat his

attempts, when the mould was instantly forced up against the vocal cords, the boy exclaiming: "It is there yet." A probe was next passed through the incision, as far as the bifurcation of the trachea, without encountering the foreign substance; but its presence caused a violent effort to cough, when the instrument was withdrawn, followed immediately by the ejection of the button-mould through the artificial aperture. The wound gradually healed, and the boy completely recovered without any serious untoward symptoms.

Case 25.—*Piece of bean; girl, aged three years; cough, dyspnœa, and bloated features; tracheotomy at the end of the third day; division, and ligation of the inferior thyroid vein; expulsion of part of the foreign body at the end of the seventh day, and of the remainder two days after; recovery.* (Calvin Jewett, M. D., New England Journal of Med. and Surg. vol. xiii. p. 237, 1824.)

Hannah Bayley, aged three years, having some beans in her mouth while her mother was passing a loose garment over her head, inhaled a portion of one into the windpipe. The more violent symptoms soon subsided, leaving merely some slight irritation, followed occasionally by a paroxysm of coughing. The accident happened on the 23d of March, and on the 25th, when Dr. Jewett first saw the patient, the pulse was one hundred and twenty a minute, the breathing was hurried and rattling, there was frequent and severe cough, and the countenance exhibited a wild, bloated, and livid appearance. The suffering continuing unabated, tracheotomy was performed on the 26th, in the usual manner, except that the incision extended nearly through the cricoid cartilage; the foreign body not being expelled, an attempt was made to extract it, but in vain. The inferior thyroid vein was divided, and bled so freely as to require a ligature. Slight improvement succeeded the operation, but in a short time the symptoms assumed a most alarming character, and on the 30th the child appeared to be almost moribund. Dr. Jewett now removed the dressings, and separating the edges of the wound, introduced a silver wire, bent in the form of a hook, with which he searched for the foreign substance, without, however, coming in contact with it. So much distress followed this attempt that he was obliged to desist. An alarming effort of coughing now came on, and in an instant a piece of bean without its hull was forcibly ejected through the artificial opening. The irritation soon abated; but on the 1st of April it returned

with great severity, leading to the belief that the windpipe was not entirely freed, which was presently found to be the fact; for, on separating the edges of the wound, the hull of the bean was seen presenting, and was easily removed. All the disagreeable symptoms now disappeared, and a rapid recovery was the consequence.

Case 26.—*Grain of corn; boy, aged four years; cough and suffocation; tracheotomy at the end of several days; immediate ejection in a fit of coughing; recovery.* (Communicated to the author by Dr. James D. Maxwell, of Bloomington, Indiana.)

This case, for the particulars of which I am indebted to my friend, Dr. Maxwell, occurred in the practice of his father in 1827. The patient, a boy, aged four years, while playing with a grain of corn in his mouth, drew it into his windpipe. The immediate effects were such as usually accompany similar accidents, as strong spasmodic coughing, a sense of impending suffocation, lividity of the countenance, and, finally, falling down in a kind of swoon. These paroxysms alternated with intervals of comparative ease for several days, when, the danger to life becoming more imminent, tracheotomy was performed by Dr. D. H. Maxwell, without much hemorrhage, and with immediate relief to the child. No forceps were used for extracting the body, it being only necessary, as the grain was passing freely up and down, to dilate the wound with the handle of the scalpel, when, during an effort of coughing, it was forcibly expelled, striking the ceiling of the room some twelve feet high.

Case 27.—*Glass bead; girl, aged five years; violent cough; tracheotomy on the morning of the fourth day; immediate expulsion of the foreign body; recovery.* (Dr. William Gibbon, London Medical Gazette, vol. xxii. p. 384.)

A little girl, five years old, playing with a glass bead in her mouth, accidentally inhaled it into the windpipe. A distressing cough immediately ensued, and continued for two hours, when the child became easier until she attempted to lie down, when the paroxysm recurred with great violence. Dr. Gibbon first saw her the following morning, and finding that she enjoyed long intervals of comfort, he was induced to defer the operation of tracheotomy until the fourth day, by which time the symptoms were quite urgent. The thyroid gland was large, and bled quite freely, thus causing

some delay in the operation. The hemorrhage having ceased, the windpipe was still open to the extent of half an inch, the incision beginning just below the cricoid cartilage. The air rushed out with great violence, and much cough was produced, but the bead was not expelled until the sides of the aperture were held widely apart with two hooks. Dr. Gibbon lays great stress on this procedure, and expresses the opinion that the foreign substance could not have been expelled by the child's effort without it. The patient rapidly recovered.

Case 28.—*Bean; child, aged six years; violent symptoms; extinction of the voice, peculiar noise at the base of the larynx. Useless employment of emetics; tracheotomy at the end of the fifth day; extraction of the body with the forceps; tracheitis and pneumonia; recovery.* (Baron Dupuytren, Leçons Orales, t. iii. p. 593. Paris, 1833.)

A child, aged six years, living at Savigny, near Paris, on the 18th of May, 1822, while amusing itself in throwing some beans into the air, and catching them with its mouth, permitted one to descend into the windpipe. It was instantly seized with cough and a sense of suffocation, which continued for an hour, when a calm ensued; which, however, was soon followed by a return of the symptoms, accompanied by frequent vomiting, and extreme anxiety. Under a supposition that the foreign body was in the œsophagus, a physician, who was called in soon after the accident, repeatedly explored that canal with the probang, and administered emetics, without success. Subsequently, leeches were applied to the upper part of the neck, which was the seat of severe pain.

On the fifth day the child was brought to the Hôtel Dieu, in a state of frightful suffering. The voice was extinct, the face swollen, the eyes projecting, the nose and lips livid, the respiration accelerated and accompanied with a strong noisy râle, both in the trachea and in the lungs. During inspiration, a kind of shock was heard at the base of the larynx, similar to that of a valve which alternately strikes the edges of the opening which it is destined to close, and which was, doubtless, induced by the presence of the foreign body. The cough was convulsive, frequent, and menacing. As there was imminent danger of asphyxia, the trachea was at once opened by an incision from an inch to an inch and a quarter in length; the edges of the aperture were next held apart, to favor the escape of the bean, which, after having presented itself several

times, was at length seized with the forceps, and extracted, all except a small piece, which was soon after ejected during a strong expiration. The bean was considerably swollen. Immediate relief followed the operation, which was attended with the expulsion of a large quantity of mucus, mixed with blood. No vessels required to be tied, and the edges of the wound were left apart, lest emphysema might arise.

Severe tracheal and pneumonic symptoms ensued the night after the operation, and for some days the life of the patient was in great danger. The cough, in particular, was most violent, and large quantities of mucus continued to be discharged through the artificial opening. For the relief of these symptoms leeches were applied to the neck and chest, the child was purged, and expectorants were freely used. By the 4th of June convalescence was established, the wound was nearly healed, the voice was perfect, the cough was nearly gone, and the appetite was excellent. Change of air was now recommended, and a rapid recovery was the consequence.

Case 29.—*Jawbone of a mackerel; child, aged two years; suffocative cough; probable lodgement of the substance in the larynx; tracheotomy at the end of the fifth day; extraction with the forceps; recovery.* (P. J. Pelletan, Clinique Chirurgicale, t. i. p. 6. Paris, 1810.)

A child, in sucking the head of a mackerel, let a piece of the lower jaw slip into the windpipe, where it produced violent suffocative cough. This symptom had lasted five days, during which various attempts had been made by the probang, emetics, and other means, to dislodge the foreign body, or force it down into the stomach. The trachea was opened, but nothing appeared at the wound, which was soon after enlarged, without any better success. Believing that the bone was in the larynx, a strip of linen was attached to the end of a probe, and being well oiled, was carried through the trachea into the fauces. This procedure did not seem to fret or worry the child, which continued to breathe freely through the incision. Presently, the foreign body appeared at the wound in the skin, from which it was removed with a pair of forceps. It proved to be the lower jaw of a mackerel, covered with numerous sharp teeth, which had doubtless been the cause of arresting it in the larynx. A slight

Fig. 39.

cough, rhonchus, and hoarseness followed the operation, but these soon subsided, and the wound was perfectly cicatrized in fifteen days.

Case 30.—*Grain of corn; boy, aged five years; dyspnœa and cough; diminished respiration in the right lung; tracheotomy five days after the accident; the foreign body finally expelled by the mouth twenty-eight days after the operation; recovery.* (B. F. Trabue, M. D., Amer. Journ. Med. Sciences, April, 1853, p. 556.)

The above case, which was communicated to me by Dr. Trabue, soon after its occurrence, happened at Glasgow, Kentucky, on the 13th of April, 1852. The patient, five years of age, while romping with a dog, permitted a grain of corn to slip into his windpipe. Urgent dyspnœa, with spasmodic coughing, ensued, and continued with frequent attacks of suffocation, until Dr. Trabue saw him, five days after the accident. Upon applying the ear to the chest, it was found that very little air entered the right lung. Chloroform having been administered, four rings of the trachea were divided, when, turning the patient's face downward, and elevating the lower extremities, the operator struck the back opposite the bifurcation of the tube, hoping thereby to promote the extrusion of the foreign body, but without success. No further interference being permitted, the wound was left open, and the child put to bed. The breathing was but little embarrassed until the fourth day, when the wound in the trachea had closed, and when a violent fit of coughing came on, threatening death every moment from spasm of the glottis. From this time until the 10th of May, paroxysms of coughing occurred at intervals of from three to five hours. The symptoms now became more violent, and the coughing continued almost incessantly, with great difficulty, until about noon the next day, when the grain of corn was forced into the mouth, and swallowed. The child had no bad symptoms afterwards.

Case 31.—*Pebble; boy, aged thirteen years; cough and dyspnœa: substance moving up and down the passage; inversion of the body, both before and after the operation; shifting of the pebble from one bronchial tube to the other; tracheotomy at the end of the fifth day; immediate expulsion of the substance; recovery.* (Anonymous. London Medical Gazette, N. S., vol. v. p. 303. 1847.)

A boy, aged thirteen years, having two pebbles under his tongue, drew one of them, while running a race, into his windpipe. The

accident, which happened on the 29th of July, was instantly followed by a fit of coughing and some dyspnœa, which, however, soon subsided. The boy stated that he could distinctly feel the pebble moving up and down the passage in the act of coughing, but expressed his conviction that it did not ascend higher than the cricoid cartilage. Mr. P. Pritchard, who saw him soon after the occurrence of the accident, placed him with his head downwards, keeping him in this position for some time, without the desired effect. The experiment, which was repeated unsuccessfully three times, always produced violent coughing and difficulty of breathing, and was followed by ecchymosis of the conjunctivæ, in consequence, doubtless, of his forcible straining. During the whole period of this ordeal, the boy said he could feel the pebble move up and down the windpipe.

The boy, upon his admission into Guy's Hospital, on the following day, was free from cough and dyspnœa; his respiration was twenty in a minute, and he slept composedly in the usual position. The diagnosis being doubtful, it was agreed to watch the patient, and to keep him constantly quiet. In the evening, it was observed by Mr. Hilton, that the left lung was nearly inactive, scarcely any murmur being audible. The breathing, however, was not attended with any distress. The night of the 31st was passed comfortably in a sitting posture, with occasional cough, but no violent dyspnœa. The left lung remained in the same condition, but in the course of the day, after a slight fit of coughing, it resumed its usual function. Nothing of moment occurred during the next two days. On the 3d of August, it was ascertained that the respiration in the left lung was complete but puerile, while at the apex of the right lung it was less full,[1] and also somewhat rough, indicating the existence of the pebble in the upper branch of the right bronchial tube. This was the state of the breathing, both at the anterior and posterior surfaces of the chest. In all the lower part of the right lung the respiration was pure and loud. The sound, on percussing the apex of the right lung, was less clear than on the left side. When the patient coughed, a movement was heard and felt as of a foreign body impelled by the air at each effort.

The diagnosis being thus clearly established, Mr. Bransby B. Cooper, on the 3d of August, opened the trachea by dividing four

[1] The reporter says "more full," but this, I suppose, is a typographical error.

of its rings. The boy coughed violently, both before and after the tube was incised, and stated that he felt the pebble move, but thought that it had escaped at the artificial orifice. A probe was carried into the trachea, in order to ascertain the situation of the extraneous substance, but with no other effect than that of making the patient cough violently. He was now inverted, and struck forcibly on the back, when he felt the stone move above the wound, and while in this position, during the act of inspiration, it fell through the opening. The pebble was about a third of an inch thick; its shape and size are represented in the annexed figure. Recovery followed without any untoward symptom.

Fig. 40.

Case 32.—*Water-melon seed; boy, aged four years; coughing and dyspnœa; emetics and errhines; tracheotomy at the end of the sixth day; immediate and forcible expulsion of the foreign substance; profuse venous hemorrhage; recovery.* (Dr. Thomas Wells, Amer. Journal of the Medical Sciences, vol. x. p. 28, 1832.)

A boy, four years of age, was eating a piece of water-melon, when, as he was playing and laughing with other children, a seed passed into his trachea. He was threatened with immediate suffocation, and fell upon the floor. The difficulty of breathing gradually subsided, and he rested pretty well the following night, with the exception of several paroxysms of cough and dyspnœa. Dr. Wells saw him, for the first time, the day after the accident, but was not permitted to perform tracheotomy, although the symptoms were of the most urgent character. Emetics and errhines were afterwards administered, in the hope that the foreign body might be ejected, but without effect. The paroxysms became more and more frequent; the breathing was permanently difficult and croupy, the pulse small and frequent, and the countenance livid. There was evidently considerable inflammation of the larynx and glottis.

The accident happened on the 16th of September, and tracheotomy was performed on the 22d. The neck was unusually fat, and a vein bled so profusely as to require the ligature. The opening in the trachea was about three-fourths of an inch in length, and its edges being held asunder by two slender instruments, the seed was instantly expelled, passing over the shoulder of one of the attendants, and falling upon the floor three yards from the table. After a few minutes the respiration became tolerably free, and the

bleeding having ceased, the wound was closed by stitches and adhesive plaster. A considerable degree of hoarseness remained for several weeks; but the recovery was complete.

Case 33.—*Prune-stone; woman, aged twenty-six; violent cough and strangulation; repeated but fruitless use of emetics; tracheotomy at the end of the sixth day; immediate introduction of a double canula into the wound; daily tickling of the right bronchial tube with a probe; expulsion of the foreign body ten days after the operation, in a paroxysm of vomiting and coughing; recovery.* (M. Jobert, L'Union Médicale, No. 68, 1851.)

Madam C., aged twenty-six years, of tall stature, nervous temperament, and habitual good health, on Monday, November 18, 1850, while in the act of laughing, allowed a prune-stone, the fruit of which she had just eaten, to pass into her windpipe. Violent cough, and symptoms of suffocation were the immediate consequences, which, however, subsided as soon as the foreign body descended into the right bronchial tube. Being measurably relieved, Madam C. sat down to dinner, as though nothing had happened. An apothecary, supposing that the stone had lodged in the œsophagus, prescribed a large quantity of tea, which she accordingly drank, but without any benefit. The cough continued all night, the breathing was somewhat embarrassed, and she felt conscious that the foreign substance was situated in the right side. The day after the accident, the countenance was slightly discolored, the respiration impeded, the cough tight and frequent, and the expectoration quite abundant, frothy, and slightly tinged with blood. The respiratory murmur was very distinct on the left side, but on the right it had lost its force; a sound, similar to that of snoring, was perceived, both during inspiration and expiration. Sometimes there was a sibilant râle in the throat. A dose of tartar emetic having been given by the medical attendant, copious vomiting ensued, followed by some improvement in the symptoms. In the evening she was bled, the blood exhibiting a sizy appearance. M. Jobert being now called in, it was agreed to repeat the bleeding, to give lenitive drinks, and to apply poultices to the chest. The unanimous opinion was that tracheotomy would have to be performed, but that it would be best, before resorting to it, to exhaust the usual remedies.

On the 21st, after the second bleeding, which was quite copious, the patient passed a tolerably good night; but the next day, to-

wards evening, the respiration was less free, and she was, therefore, again bled, the blood, as before, exhibiting an inflammatory aspect.

On the 22d there was no visible improvement; in the evening the patient was cupped, notwithstanding which she passed a bad night; she felt as if she should be suffocated, and there was hardly any respiratory murmur on the right side. An emetic of ipecacuanha was given on the 23d, with no relief; on the following day tracheotomy was performed by M. Jobert. The external incision disclosed a large vein, lying vertically beneath the skin, which was pressed to one side, and thus protected from the knife; the thyroid body was uncommonly large, and, after having been partially detached, was raised up by an assistant until the operation was over; several small arteries and veins were tied; and, finally, the middle thyroid artery of Neubauer, which was seen pulsating at the inferior extremity of the wound, was held out of the way, when the trachea was divided in the usual manner, and a double canula immediately introduced into the opening. No attempt was made to look for the foreign body. It was noticed, as a curious fact, that, after the operation was completed, and the tube introduced into the wound, the patient had almost entire control of the voice, although there was a free escape of air at the artificial aperture. M. Jobert endeavors to explain this occurrence by supposing that the air which passed between the canula and the posterior part of the windpipe was sufficient to excite the vocal cords. The patient became composed soon after the operation, and passed a tolerably good night.

The day after the operation, M. Jobert withdrew the canula, and explored the windpipe with a probe, which he carried as low down as the right bronchial tube, and up into the glottis, hoping thereby to provoke coughing, and thus promote the expulsion of the prune-stone. The patient made violent efforts, but the foreign body not appearing, the canula was reintroduced, but was expelled soon afterwards by the cough and pressure of the thyroid gland, which, in consequence, was held up by a double ligature, well waxed, passed through its substance, and fastened by a pin to each side of the patient's cap. Nothing of moment occurred up to the 5th of December, there being no material change in the symptoms, until the evening of this day, when the woman became feverish, and complained of pain in the chest. For the relief of these symptoms leeches were applied over the base of the right lung. It should

have been stated that, from the 26th of November to the 5th of December, M. Jobert excited, every morning, a violent fit of coughing by the introduction of a probe into the right bronchial tube. At length, at the period here mentioned, the patient, having taken a bowl of cocoa-nut, experienced, about ten o'clock in the morning, pain in her heart; she made efforts to vomit, and threw up some of the fluid which she had just before swallowed; presently, she was seized with coughing, and immediately after the stone was ejected through the wound. It was quite large, and looked as if it had been slightly altered on the surface. The wound gradually healed, the cicatrization beginning at the skin, and steadily extending inwards, so that the parts were elevated for some time by the air, as it escaped through the inclosed tracheal aperture, without, however, diffusing itself through the connecting cellular tissue.

Case 34.—*Brass button; negress, aged six years; aphonia, and absence of respiratory murmur in both lungs; tracheotomy on the seventh day; ejection of the foreign substance during vomiting; recovery.* (Author.)

On the 24th of September, 1849, my friend, Dr. Pendleton, of Oldham County, Kentucky, sent me a little negress, about six years of age, on account of a brass button in the windpipe, which she had accidentally inhaled, while playing with it, a week previously. The introduction of the foreign substance was instantly followed by a sense of suffocation and a violent paroxysm of coughing, which, after some time, gradually subsided, recurring, however, occasionally afterwards, until the body was finally ejected. The voice became immediately extinct, but after a few hours the child was able to talk in a whisper, though she could not speak aloud until after the operation. No vesicular murmur could be perceived, after the most careful examination, in either lung, but the chest sounded well on percussion, and there was no evidence of pneumonia, bronchitis, or pleurisy. With the exception of the aphonia, very little seemed to be amiss in the case.

Believing that the button was in the larynx, I proceeded at once to the operation of tracheotomy. An incision, about two and a half inches in length, was made along the mesian plane of the neck, extending from the lower portion of the thyroid body to within a short distance of the sternum. The tube was very small, and covered by large veins, which were with difficulty avoided by

the knife. Four rings of the trachea were divided, leaving a wound about ten lines in length. An attempt was now made to dislodge the button, first with a grooved director, then with a female catheter, and finally with a sponge probang, passed through the larynx to the fauces, but to no purpose. A few minutes after these efforts were discontinued, the child was seized with a violent fit of vomiting, in which the button fell from the mouth. The wound, drawn together by adhesive strips, healed by the first intention, and the little girl rapidly recovered without an untoward symptom.

Fig. 41.

Case 35.—*Piece of hazel-nut shell; boy, aged fifteen; cough and suffocation; husky and croupy voice; pain in the throat and trachea; tracheotomy on the seventh day after the accident; administration of chloroform; expulsion of the body twenty-eight days after the operation, the wound having healed; recovery.* (Mr. David Johnston, London Lancet for 1851, vol. ii. p. 600; Philadelphia Medical Examiner, March, 1852, 192.)

A youth, aged fifteen, on Thursday the 1st of May, while cracking and eating hazel-nuts, permitted a piece of shell to pass into the windpipe. The accident happened in a fit of laughing, and was instantly followed by a paroxysm of suffocative cough, which lasted nearly an hour, and left him in a state of extreme exhaustion. He had some disturbed sleep during the night, and next day he felt pain about the throat, but no difficulty in swallowing. Towards evening his breathing became croupy and his voice husky. On the following Monday, he complained of acute pain, increased by pressure, in the trachea, about an inch above the top of the sternum; he experienced also a sense of constriction in the chest, and pain in the left side, in the region of the nipple. In other respects, the symptoms were as before, only more aggravated. A loud, hoarse sound was heard over the trachea, both during inspiration and expiration. The vesicular murmur was more audible over the upper part of the right lung than the left, and percussion also yielded a clearer sound over the right than the left side. The respiration was twenty-four in a minute.

Tracheotomy was resorted to on the 7th of May, the seventh day after the accident, the opening in the tube being about one inch and

a half in length. After the lapse of a few minutes, an attempt was made to ascertain, by a probe, the situation of the shell. The irritation, however, caused by this proceeding, obliged the operator at once to desist; and a second effort, made soon after, was followed by no better result. At this stage, chloroform was administered, with the happiest effect; a thorough exploration of the trachea, larynx, and fauces being made with the probe and finger while the patient was under its influence. No foreign substance, however, was detected. The examination was repeated some hours afterwards, with no more satisfactory result. The child remained in a critical condition for several days after the operation, requiring the use of leeches, purgatives, antimony, and mercury.

On the 12th day of May, he was considerably better, although the dulness and absence of the respiratory murmur, as well as the flattened and immovable state of the left side of the thorax, continued; the cough had diminished, the breathing was more natural, and the patient was able to pass nearly the whole day out of bed. This improvement went on progressively until the 17th, the day on which he ceased to breathe through the wound, and on which his voice recovered its natural tone; when all the amendment which had taken place was suddenly dissipated, and the same train of inflammatory symptoms occurred which had proved so troublesome immediately after the operation. The same kind of treatment was resorted to, and by the 31st the patient was again in a comparatively comfortable condition. On that day a small abscess was opened on the left side of the neck, which discharged about a tablespoonful of pus.

On the 4th of June, that is, thirty-five days after the accident, the patient was suddenly seized with a severe lancinating pain in the chest, behind the lower part of the sternum, accompanied by a violent paroxysm of coughing which lasted twenty minutes, and during which the piece of nutshell was expelled by the mouth. It was of an irregular, oblong form, rough, and notched on the edge, being half an inch in length and three-eighths of an inch across the widest part of its narrow diameter. By the 17th of June, all indication of disease had vanished.

Case 36.—*Pebble; boy, aged seven years; urgent symptoms; tracheotomy at the end of a week; immediate expulsion of the foreign body; recovery.* (Dr. R. L. Howard, Ohio Medical and Surgical Journal, vol. i. p. 395, 1849.)

On the 1st of August, a boy, aged seven, was brought to the late Professor Howard, of Columbus, on account of a pebble in the windpipe, inhaled one week previously, while lying on the floor with the foreign substance in his mouth. Symptoms of suffocation immediately ensued, threatening speedy dissolution; but these soon passed off, and the patient experienced no inconvenience, except on coughing, or exercise, when the spasmodic respiratory efforts forced the pebble alternately up and down against the cricoid cartilage and the bifurcation of the trachea. Tracheotomy was performed one week after the accident, and as soon as the bistoury was withdrawn a convulsive cough expelled the pebble with great force. The wound united by the first intention, and the boy was perfectly well in three days.

Case 37.—*Bean; girl, aged three years and a half; ordinary but urgent symptoms; tracheotomy on the eighth day; immediate expulsion of the foreign substance; recovery.* (Dr. Zadok Howe, of Massachusetts; American Journal of the Med. Sciences, vol. iii. p. 347. Phila. 1828.)

A little girl, aged three years and a half, on the 21st of September, while at play in the garden, drew a bean into the windpipe. When Dr. Howe saw the case, two hours after the accident, the symptoms were so mild, and the diagnosis so uncertain, that no treatment was deemed necessary. Recalled on the 28th, he found the child laboring under frequent and distressing paroxysms of coughing, attended with "suspended respiration," and other urgent phenomena, which clearly indicated the necessity of an operation. A free external incision having been made, three of the rings of the trachea were divided, when the edges of the opening were freely separated with the finger. Immediately after withdrawing the finger a spasmodic effort took place, followed by the forcible ejection of the bean. The external wound was covered with adhesive strips, but the air continued to rush out occasionally for forty-eight hours, after which the healing process went on without any further interruption, and the child soon recovered.

Case 38.—*Half an acorn; girl; violent cough and retching; fruitless employment of various remedies; tracheotomy at the end of the eighth day; hemorrhage; immediate extraction of the foreign body with the forceps; recovery.* (F. Wendt, M.D., Historia Tracheotomiæ nuperrime administratæ. Vratislaviæ, apud Meyerum, 1774.)

A girl accidentally inhaled half an acorn. She was immediately seized with violent coughing and retching, which, however, speedily subsided, but recurred with great severity whenever the foreign substance changed its situation. Every variety of remedies, some of them of a very ludicrous character, was employed in vain for eight days, when Dr. Wendt performed the operation of tracheotomy. The external incision extended from the larynx to the sternum; and, as soon as the hemorrhage, which was quite free, had measurably ceased, the tube was opened by dividing its three upper rings. The edges of the wound were now separated by blunt-hooks, when the foreign substance appearing at the aperture, was immediately extracted with a pair of forceps. The division of the trachea was embarrassed by a violent paroxysm of coughing, which renewed the bleeding at the bottom of the external wound, and thus occasioned some delay. The girl being relieved, the parts were approximated by adhesive strips, except at their inferior angle, where a small aperture was left for the discharge of mucus. The night after the operation, the air escaped at the wound, thus necessitating a firmer application of the dressings. Some fever ensued, and for several days the patient was troubled with an harassing cough. The wound suppurated hardly any, and was completely cicatrized at the end of the sixteenth day.

The above case is of great interest, as being one of the first of the kind that ever occurred in the north of Europe. It is remarkable how barren the German Medical literature is of cases of foreign bodies in the air-passages. I have carefully examined Hufeland's *Journal of Medicine—Bibliothek der Practischen Heilkunde*—from the time of its commencement, in 1799, down to the year 1836, without finding more than two or three examples.

Case 39.—*Grain of corn; girl, aged three years; frequent and distressing paroxysms of coughing; tracheotomy on the eighth day; ejection of the body two days after; recovery.* (Dr. Jabez W. Heustis, of Alabama; New York Med. and Physical Journal, vol. v. p. 557.)

On the 6th of January, 1826, Dr. Heustis was requested to see

a child, aged three years, who, a week previously, had accidentally been choked with a grain of corn. He found the respiration short, rattling, and laborious, with frequent and distressing paroxysms of coughing, and at once determined to attempt relief by tracheotomy. Having, in dividing the parts, cut a considerable-sized vein, he secured it with a ligature, and then proceeded to expose and incise the windpipe. The foreign body not appearing, search was made for it with the probe, but without success. A director was then introduced, and pushed through the larynx into the throat, with no better luck. The wound was now dressed with lint, spread with simple cerate, and the child conveyed to bed. Some relief ensued, inducing the belief that the grain of corn had been removed. It was not, however, until two days after that it presented itself at the wound, and was extracted. It was somewhat softened and swollen, but exhibited no signs of germination. The wound was completely closed in a fortnight, and the little patient entirely recovered.

Case 40.—*Sheep's tooth; girl, aged seven years; suffocation and cough; tracheotomy on the tenth day; chloroform; expulsion of the foreign body immediately after the operation in a fit of coughing; recovery.* (Mr. John Rayner, London Lancet, vol. i. p. 231, 1848.)

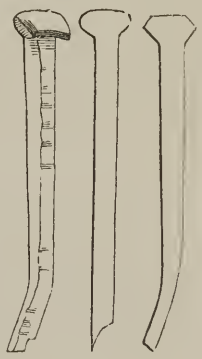
A girl, aged seven years, was admitted into the Stockport Infirmary on the 24th of January, 1848, having, during a fit of coughing, swallowed a sheep's tooth, with which she had been amusing herself. She was immediately seized with symptoms of suffocation, which had, however, entirely left her on her arrival at the institution. She was, therefore, permitted to return home, and, with the exception of a short, tickling cough, she remained free from suffering until the 2d of February, when, becoming worse, she was readmitted. A minute examination of the chest led to the discovery that the foreign body was lodged in the right bronchial tube, and that it completely prevented respiration in the corresponding lung. Tracheotomy was now performed, and a few minutes after its completion, in a violent fit of coughing, the tooth was forcibly expelled through the wound. Chloroform was employed before the operation, and had the effect of completely quieting the windpipe and adjacent parts. It was only during coughing that the veins became in the least turgid, except for a few minutes before the trachea was opened, while the little patient was under the influence of this agent.

Immediately after the operation the cough ceased, and the child fell into a sound sleep. When the case was reported, she was rapidly convalescing.

Case 41.—*Nail; boy, aged three years; tracheotomy on the eleventh day after the accident; long-continued attempts at extraction; closure of the wound; expulsion of the substance on the thirty-third day after the operation in a fit of coughing; recovery.* (Dr. Calvin Jewett, Boston Med. and Surg. Journ., vol. xvi. p. 88, 1837.)

William Beldon, aged three years, on the evening of the 10th of December, 1836, inhaled an iron nail, one inch and seven-eighths in length, and weighing fifty-five grains. The symptoms were frequent irritative cough, sometimes though seldom approaching to suffocation, hurried respiration, and difficulty of lying on the left side, with a desire to keep the head constantly elevated. The ear, applied to the right side of the chest, detected a peculiar hissing and rattling sound; while the hand, placed upon the same region, felt a sensation like crepitus. None of these symptoms existed in the opposite lung. The child complained of no pain, or disagreeable feeling. On the 21st his strength was perceptibly failing; he had become restless, and was more irritable than at any time previously. Tracheotomy was now performed, and every effort made for nearly two hours, but without success, to extract the foreign body, which was repeatedly felt in the right bronchial tube. The wound was closed with adhesive plaster, and the air ceased to escape through it in thirty hours. Some improvement in the breathing followed, and the child continued better than before the operation until about the 20th of January, when, in consequence, apparently, of having taken cold, his cough and respiration became more troublesome. On the morning of the 23d, the cough having increased in violence, the nail was expelled, and found by the father upon the child's pillow. The recovery was rapid and complete.

Figs. 42, 43, 44.



The above case is one of great interest, not only on account of the long retention of the foreign body after the operation practised for its removal, but on account of the fact, mentioned by the narrator, that various instruments may be repeatedly introduced, for

nearly two hours, through the artificial opening, into the trachea and bronchial tube without destroying life. The nail was touched again and again with the probe, forceps, and other contrivances provided for the occasion, and yet it was impossible to seize and extract it.

Case 42.—*Ten-penny nail; boy, aged eight years; ordinary symptoms, followed by emaciation; tracheotomy thirteen days after the accident; ejection of the foreign substance six days after the operation: recovery.* (Communicated to the author by Professor E. H. Davis, M. D., of New York.)

In the summer of 1846, a son of John Clay, of Ross County, Ohio, was playing upon the tongue of a wagon with a broken nail in his mouth. In falling over the pole he took a deep inspiration, followed by the escape of the nail into the air-passages. The usual symptoms ensued. Medical aid was immediately called, but as there was some doubt in regard to the nature of the case, no operation was performed. Dr. Davis saw the boy, for the first time, three days after the accident. He soon satisfied himself of the existence of a foreign body, but not deeming it prudent to open the windpipe, he sent him home, with some simple directions as to his position during the paroxysms.

Ten days after this the patient returned, somewhat emaciated, with all the symptoms much aggravated. As further delay appeared to be hazardous, Dr. Davis determined to operate. After opening the trachea, he made several explorations with a long, slender pair of forceps, in the hope of finding and seizing the foreign body, but without success. His efforts were renewed, with no better luck, on the succeeding day. The boy was then sent home, with the injunction that during every paroxysm of coughing his body should be carefully inverted, to favor the escape of the nail. On the sixth day after the operation, while in the position recommended, he coughed up the foreign substance. It was firmly imbedded in a ball of mucus, or mucus and lymph, and proved to be the head and a part of the body of a ten-penny nail, three-quarters of an inch in length. Rapid and permanent recovery ensued.

Case 43.—*Two bodies, a water-melon seed and the shank of a plum; boy, aged three years; altered state of the voice; whistling noise in breathing; symptoms always aggravated at night; tracheotomy on the fifteenth day, the child being under the influence of chloroform; almost immediate expulsion of the two substances; division of the isthmus of the thyroid gland; recovery.* (W. H. Van Buren, M. D., Transactions of the New York Academy of Medicine, vol. i. p. 105, 1851.)

James Gallagher, a healthy child, three years of age, being engaged in eating preserved plums, was suddenly seized with a violent strangling cough, threatening suffocation. It was of a shrill, croupy character, and was occasionally attended with a whooping sound during inspiration. The father, who was present at the time of the accident, stated that he heard a distinct clicking, with a valve-like sound in the throat. The paroxysms of dyspnœa and coughing usually lasted from thirty minutes to two hours, and were uniformly worse at night, especially from eleven o'clock until morning. The voice had been unnatural from the first day of the accident, and there was a constant whistling noise in the windpipe, both in inspiration and expiration. Dr. Van Buren did not see the child until the fifteenth day. At this time his face was puffy and œdematous, the expression of the countenance anxious, and the pulse preternaturally frequent. The respiratory murmur was normal in both lungs, and the chest sounded well everywhere on percussion. There was no clicking noise in the windpipe. Pressure on the thyroid cartilage always induced pain, and generally a paroxysm of severe coughing. From a thorough examination of the case the conclusion was formed that the foreign bodies were in the windpipe, and not in the bronchial tubes.

Chloroform being administered, the trachea was laid open from the first to the sixth or seventh ring, and in less than two minutes the two foreign bodies were expelled, the shank of the plum lodging in the external wound, while the melon-seed was projected to a distance of several feet. The urgent symptoms at once disappeared, and the edges of the outer wound were, therefore, almost immediately approximated by sutures and adhesive strips. The child was kept insensible until the dressings were completed; a period of fifty-five minutes. During the operation the isthmus of the thyroid gland was divided, notwithstanding which there was hardly any hemorrhage. Most of the wound united by the first intention, and in less than two weeks the child was dismissed well.

Case 44.—*Brass ring; child; cough, croupy voice, and whistling noise; tracheotomy at the end of the nineteenth day; immediate extraction; recovery.* (Mr. Richardson, Lond. Lancet, vol. i. p. 247, 1852.)

A child, a patient of Mr. Orton, of Narborough, England, inhaled a brass ring, about the size of a shilling, with a hole in the centre. It remained in the windpipe for nineteen days, the symptoms being an occasional cough, attended by a croupy sound, and a whistling noise during sleep. Tracheotomy was performed at the end of the period above specified, and the foreign body pushed upwards, and seized by a pair of forceps at the opening of the larynx, in one of the ventricles of which it had probably been arrested.)

Case 45.—*Cherry-stone; girl, aged six years; violent cough, and suffocation; venesection; tracheotomy on the nineteenth day after the accident; spontaneous expulsion of the foreign substance two months and a half after the operation; recovery.* (Mr. Benjamin Travers, Jr. Medico-Chir. Trans. of London, vol. xxiii. p. 108.)

A robust girl, six years of age, while sitting upon some straw in the yard, was suddenly thrown backwards by a pig concealed beneath the heap. She was eating cherries at the moment, and was immediately seized with a violent fit of choking, with every symptom of impending suffocation. This condition lasted an hour, when she fell asleep. The accident happened about four o'clock in the afternoon on the 19th of July. On waking she had a slight cough, but slept well during the ensuing night. On the 20th, there was some spasmodic pain in the chest, and on the 21st the breathing and other symptoms were so urgent that twelve ounces of blood were taken from the arm. On the 22d, towards evening, the patient had a violent convulsive cough, the pulse was small and quick, the surface livid, and the eye suffused, with every appearance of impending suffocation. The spasm subsided in two hours, but at noon the next day a similar seizure occurred, attended with violent jactitation and a copious flow of frothy mucus from the mouth; the cough was frequent and sonorous. The attacks now daily returned until the 7th of August, when tracheotomy was resorted to, with immediate relief of the urgent symptoms, but without the ejection of the foreign body.

Towards the close of September the wound, which had been tented, was healed. In the beginning of October the child coughed incessantly, and had night-sweats, with loss of strength and appetite.

On the 26th the stone, together with a tablespoonful of pus, was ejected during a violent paroxysm of coughing. The child had, in fact, expectorated pus in small quantities for many days before this happy occurrence. From this time the cough never returned, and the general health was soon re-established.

Case 46.—*Shingle nail; boy, aged five years; emetics, and inversion of the body; tracheotomy three weeks after the accident; chloroform; situation of the foreign body in the left bronchial tube; extraction with the forceps; recovery.* (Paul F. Eve, M. D., Nashville Journal of Medicine and Surgery, vol. v. p. 129.)

The subject of this case, a healthy boy, five years old, was brought to Professor Eve on the 20th of June, 1853, having, two weeks previously, inhaled a fourpenny nail, which he had introduced into a cotton-spool with the design of making a whistle, and which suddenly slipped into the windpipe as he was taking a deep inspiration. The usual symptoms followed, and measures were immediately taken to secure, if possible, the expulsion of the foreign substance. With this view, emetics were administered; and the body, suspended by the heels, was repeatedly struck on the back and chest, but without success. When Dr. Eve first saw the boy, a bronchial rhonchus could be heard at a distance in both lungs, but particularly in the left, and there were also different degrees of sibilant sounds, alternating with the moist. There was cough, with some expectoration, every morning, and occasional dyspnœa, especially after exercise. The general health was hardly at all disturbed; the appetite was good, and the child went about as usual.

Tracheotomy was performed, while the boy was under the influence of chloroform, on the 27th of June; that is, three weeks after the accident. Four of the rings of the trachea being divided, a pair of forceps, closed and used as a probe, was introduced into the right bronchus, but their handles coming in contact with Trousseau's instrument, employed for holding open the wound, it was uncertain whether they touched the nail or not. A probe was then passed down, and readily detected it on the left side, where it was at once seized with the forceps, and extracted. It lay about two inches below the top of the sternum, at an angle with the perpendicular line, in the left bronchus, with the head downwards. The nail was very rough, slightly oxidized, and nearly one inch and a half in length. Scarcely an ounce of blood was lost. The child was about

half an hour on the table, as some time was consumed in waiting for the cessation of the bleeding before opening the trachea, and also by the free vomiting caused by an overloaded state of the stomach previous to the operation.

The after-treatment was of the simplest kind. Two sutures, applied to the skin, had to be removed on account of threatened emphysema, after which the wound was left without any dressing. Under the influence of light diet, cooling drinks, and a little aperient medicine, the child rapidly improved, and on the 4th of July he was sent home, where he soon entirely recovered.

Dr. Eve thinks that much of the success of the operation, in this case, was due to the influence of chloroform, which calmed the little patient, and thus enabled him to perform the necessary manipulations. The vomiting, which was very free, was occasioned by an overloaded state of the stomach, of which he was at the time entirely unaware.

Case 47.—*Half sovereign; a gentleman; cough and choking; inversion of the body; tracheotomy on the twenty-fourth day after the accident; expulsion of the offending substance on the sixteenth day after the operation; recovery.* (Sir Benjamin C. Brodie, Medico-Chir. Trans., London, vol. xxvi. p. 286.)

On the 3d of April, 1843, Mr. Brunel, of London, in amusing some children, immediately after dinner, placed a half sovereign in his mouth, which by some accident slipped behind the tongue, causing a violent fit of coughing and choking, and the forcible ejection of the contents of the stomach. He strained two or three times afterwards, but did not again vomit. In the course of the evening he coughed at intervals, though not violently; and for the next twenty-four hours, he complained of some stiffness and soreness in the throat. During the next two days, he experienced little or no inconvenience; he had no cough, and he employed himself as usual. On the 6th of April the cough returned, and on the 9th, it became aggravated, apparently from exposure to cold. He expectorated some mucus slightly tinged with blood, and experienced a pain in the side of the chest, in the situation of the lower portion of the right bronchial tube. An aperient, followed by vomiting, greatly relieved these symptoms; but on the 11th of April, the cough was again troublesome, and on the 17th it was much increased by exposure to a cold, easterly wind. On the 19th, the

patient was placed in the prone position, with his sternum resting on a chair, and his head and neck inclining downwards, when he immediately had a distinct perception of a loose body slipping forward along the trachea. A violent convulsive cough ensued. On resuming the erect posture, he again experienced the sensation of a loose body moving in the trachea, but in the opposite direction, that is, towards the chest. On the 25th, a somewhat similar experiment was made. At first, no cough ensued; but on the back, opposite the right bronchial tube, having been struck with the hand, the patient began to cough violently. The half sovereign, however, did not make its appearance. This process was twice repeated with no better result; and, on the last occasion, the cough was so distressing, and the appearance of choking so alarming, that it was evident that it would be imprudent to proceed further with this experiment, unless some precaution were used to render it more safe.

On the 27th of April, tracheotomy was performed, and an attempt made, but without success, to reach the coin with the forceps introduced through the artificial opening. The contact of the instrument always induced the most violent convulsive coughing. The coin could not even be felt. On the 2d of May, these trials were repeated with the same result. Determined to desist from all attempts of this kind, the patient was permitted to rest until the 13th of May, when, being placed in the prone position, upon a platform made movable on a hinge in the centre, the shoulders and body were fixed by means of a broad strap, and the head was lowered until the platform was brought to an angle of about 80 degrees with the horizon. The back was now struck with the hand; two or three efforts to cough followed, and presently he felt the coin quit the bronchial tube, striking, almost immediately afterwards, against the incisor teeth of the upper jaw, and then dropping out of the mouth. A small quantity of blood, drawn into the trachea from the granulations of the external wound, was at the same time ejected; no spasm in the muscles of the glottis took place, and there was none of the inconvenience and distress which had caused so much alarm on the former occasion. A speedy recovery was the consequence. It is worthy of remark that the stethoscope, which was repeatedly applied to the chest during the progress of this case, detected no difference in the state of the respiration.

Case 48.—*Persimmon seed; child, aged four years; cough; gradual exhaustion; tracheotomy at the end of four weeks; expulsion of the foreign body the day after the operation; recovery.* (Dr. S. Annan, Amer. Med. Recorder, vol. vii. p. 43, 1824.)

When Dr. Annan saw this case, the foreign body had been in the windpipe four weeks; "but not," he adds, with great naivete, "being easily affected by heat and moisture, it had not enlarged so much as to produce dyspnœa." The only troublesome symptom until a few days before was an occasional violent paroxysm of coughing, produced, apparently, by the dislodgement of the seed from the bronchial tube, and its propulsion upwards against the larynx. Considerable fever had also existed for several days, and it was obvious that the child was gradually sinking under the pulmonary irritation. The operation was performed at the first visit; but with all the exertions the child could make, Dr. Annan was unable to force the seed up into the trachea. The next day he was informed that the little patient had had one of its ordinary paroxysms of coughing, during his absence, showing its dislodgement. He therefore opened the wound, and had the satisfaction to see it forced out with but little trouble, accompanied by a large quantity of purulent matter. The child soon recovered.

Case 49.—*Water-melon seed; boy, between four and five years old; croupy cough; pneumonia; gradual wasting; repeated emetics; tracheotomy at the end of five weeks; immediate ejection of foreign body; recovery.* (H. G. Jameson, M. D., American Medical Recorder, vol. v. p. 673.)

A boy, between four and five years old, got a water-melon seed into his windpipe in July, 1822. When Dr. Jameson first saw him eight days had elapsed since the accident. The child had high fever, incessant croupy cough, and inflammation of the lungs. Blood being taken from the arm, and several emetics administered, he seemed to be almost free from disease for several days; he then became again harassed with violent cough and a feeling of strangulation, which continued until he was nearly exhausted. In this condition he remained upwards of three weeks, gradually losing flesh and strength, and the emetics no longer affording any relief. The parents now gave their consent to the operation, and, five weeks after the accident, Dr. Jameson opened the trachea. The moment this was done, the seed was ejected from the glottis, as if

from a popgun. Some fever followed, but there was very little cough, and that was free from the peculiar croupy sound previously present. The child rapidly recovered.

Case 50.—*Pebble; boy, nine years old; violent cough and dyspnœa; peculiar sound in coughing; inversion of the body; tracheotomy at the end of about the eighth week; immediate expulsion of the foreign substance; recovery.* (Mr. J. Luke, London Med. Gazette, vol. xxii. p. 296.)

John Tyler, a stout, robust boy, aged nine years, was admitted into the London Hospital, February 6, 1838, on account of a pebble which had slipped into his trachea about a month before. It caused, at first, great pain in the right side of the chest, particularly over the mammary region, attended with violent attacks of cough and dyspnœa, and followed by symptoms of acute inflammation, for the relief of which he was lecched, blistered, and purged. An attempt had been made in the country to remove the stone by suspending him in the inverted position, but it nearly produced asphyxia. On his admission, he stated that he could not walk a mile without stopping, or even lying down, several times, from the distress in his chest, and that he had frequent attacks of suffocative cough, especially at night. During these attacks his face becomes frequently purple; the voice is slightly cracked; and all the associated respiratory muscles are raised considerably in his ordinary breathing. The respiratory murmur is sensibly obstructed in the lower part of the right lung, and is marked, now by a sibilous, and now by a sonorous râle, particularly distinct a little above the right mamma. On the left side there is a much slighter wheeze, and the respiratory murmur throughout the lung is puerile. The sound of the voice is very loud and distinct on the right side, in the situation mentioned.

The sound produced by coughing is very peculiar. It resembles the sudden and violent click of a valve; it is heard in the direction of the larynx, and gives one the idea of a large globule of hardened mucus stopped suddenly in its upward progress by the closure of the rima of the glottis. It is attended by a feeling of suffocation, and is occasionally followed by a croupy sound on inspiration. The boy says that he feels something move when he coughs. On the 21st of February, the respiratory murmur was masked by a râle on both sides of the chest. There was now excessive noise in the

trachea, and the same valvular click was heard in coughing as before.

Tracheotomy was performed on the 23d of February; several vessels bled freely, and required to be tied; the opening in the windpipe was made nearly an inch long, and during the coughing which ensued the clicking of the stone was heard loudly and violently. Believing that the aperture was insufficient for the exit of the pebble, Mr. Luke cut out a piece of the trachea on one side of the incision. The pebble, with the excised portion of the tube, was instantly blown out with considerable force, and to some distance, by a violent cough. The stone was of the shape of a kidney bean, $\frac{9}{16}$ths of an inch in length, and $\frac{7}{16}$ths broad. The wound gradually healed, and a perfect recovery took place.

Case 51.—*Pieces of gravel and beans; child, aged seventeen months; extreme debility and emaciation; anthelmintic remedies; tracheotomy fifty-eight days after the accident; ejection of a pebble immediately, and of matter, and several fragments of beans on the next day; recovery.* (Dr. Enos Barnes, New York Med. and Physical Journ. vol. vi. p. 78.)

A child, seventeen months old, having several gravel stones and pieces of beans in its mouth, permitted some of them to enter the windpipe. Violent coughing was the immediate result, but this soon subsided, and the respiratory organs became perfectly quiet. Subsequently, however, the cough recurred, being generally short, dry, and hacking, though occasionally very severe. Eight days had elapsed when Dr. Barnes first saw the child. Under the impression that it had worms, the parents refused to give their consent to an operation; and he accordingly withdrew from the case, prescribing merely some anthelmintic remedies. Recalled upwards of six weeks after, he found the child greatly debilitated and emaciated. He now opened the trachea, and turned the child with its face downwards, when a pebble was ejected, and fell upon the floor. The wound being kept open, the next day there was a copious discharge of pus, containing several fragments of beans, and the skin of one almost entire. The parts were then brought together, and a rapid recovery was the consequence.

Dr. Barnes relates, in the work above cited, another case, by Dr. Henry Spence, in which a child, two years old, was supposed to have inhaled a large sewing thimble. Some irritation and cough

ensued, but soon subsided, and the little patient continued its amusements, undisturbed, the remainder of the day, and slept quietly during the night. The next day it was perfectly calm and free from uneasiness. The palate, however, became gradually inflamed and swollen, and there was an increased discharge from the nose, mingled occasionally with blood. Added to these symptoms were want of appetite and difficulty of breathing, especially during sleep. Various remedies, as active emetics and cathartics, were employed, without any permanent benefit. Three months having now elapsed since the accident, Dr. Spence had the child carefully confined, when, taking a pair of long, curved forceps, he seized the thimble, and finally succeeded, after pulling in various directions, in extracting it, though not without much trouble, owing to the firmness with which it was impacted.

I can hardly suppose, from a careful perusal of the above case, that the foreign body was lodged in the larynx. It is much more probable, judging from the size of it, and the great disproportion between it and the larynx, that it was situated at the lower and lateral part of the pharynx.

Case 52.— *Water-melon seed; child, between twelve and fourteen months old; cough and dyspnœa; change in the site of the intruded substance; tracheotomy at the end of the sixty-fifth day; immediate ejection of the foreign body; recovery.* (Communicated to the Author by Dr. John W. Compton, of Knottsville, Kentucky.)

On the 30th of August, 1852, Dr. Compton was requested to consult with Dr. Brown, in the case of a child, between twelve and fourteen months of age, supposed to be laboring under a foreign body in the trachea. Circumstances favored the idea of its being a water-melon seed, the child having been seen playing with some, and also putting several into his mouth just the moment before the accident. The paroxysms of dyspnœa were very frequent and urgent. The situation of the foreign body changed with the position of the child, as was clearly evinced by auscultation. He rested best when the substance was in the right bronchial tube, where its presence was detected by a whistling sound and by puerile respiration. Dr. Compton advised the immediate performance of tracheotomy, but was overruled by Dr. Brown and the parents of the child. The symptoms grew gradually worse; the bronchial irritation was constant; and a most distressing cough set in the first

week, and continued to increase to an alarming extent; being followed, at the end of two months, by emaciation and purulent expectoration. The matter ran so freely from the nostrils during sleep, as to induce the belief that an abscess had formed round the foreign body.

The case having reached this crisis, tracheotomy was again proposed, and being consented to, was performed by Dr. Hodges on the 5th of November, about sixty-five days after the introduction of the foreign substance. Some difficulty and delay were occasioned in consequence of the great shortness and thickness of the little patient's neck. The moment the tube was opened, and the child turned on his face, the seed flew out, and fell upon his lip; a circumstance which caused some doubt as to whether it had been expelled by the mouth or at the artificial opening. The wound was dressed in the usual manner, and recovery took place without one untoward symptom.

Case 53.—*Half a kernel of a hickory nut; boy, aged five years; symptoms of suffocation, wheezing respiration, distressing cough, fever, and emaciation; abscess in the left lung; tracheotomy at the end of about ten weeks and a half; rupture of the abscess with the probe; escape of a large quantity of pus, accompanied by the foreign body; recovery.* (Communicated to the Author by John L. Atlee, M. D., of Lancaster, Pennsylvania.)

Henry Heiss, aged five years, a fleshy, active boy, on the 25th of April, 1845, while eating some shellbark hickory nuts, allowed half a kernel to pass into the windpipe. He was immediately seized with symptoms of suffocation, accompanied with great alarm and anxiety; but after a few minutes the breathing became less laborious, although it was not entirely relieved. For two days, there was considerable wheezing; it then subsided, but returned again in about a fortnight. The day after the accident, the child was seen by a physician in the neighborhood, who contented himself with prescribing a cathartic, without holding out any other prospect of benefit. Dr. Atlee saw the boy, for the first time, ten weeks after he had inhaled the foreign body, when he was informed that he had suffered, all along, under distressing cough, attended with fever, and progressive emaciation; there was a loud wheezing sound in respiration, which was very short and hurried, the skin was hot and dry, and the pulse was about one hundred and twenty

in the minute. The whole of the left side of the chest was flat on percussion, but less so just below the clavicle than further down; at this place, also, there was a clicking or slight metallic sound. Immediately beneath the nipple, the flatness was unusually great. But little air seemed to enter the left lung, especially about the middle, or opposite the point just indicated as being so very dull on percussion. There was not much mucous râle, either during coughing, or in ordinary respiration. The motion on the right side of the chest was much greater than on the left, and the sounds in the corresponding lung were abnormally strong. No unnatural hardness could be discovered on pressure along the course of the trachea. From a thorough examination of the case, the conclusion was that the foreign body was lodged in the left bronchial tube, and that it had given rise, not merely to inflammation of the mucous and parenchymatous structures, but to an abscess.

On the 3d of July, tracheotomy was performed by dividing the three upper rings of the windpipe. There was no active hemorrhage, but a considerable oozing of blood, especially from the thyroid gland, which lasted for a long time, and delayed the progress of the operation. As soon as it had ceased, an attempt was made to introduce a silver probe; but this was immediately followed by incessant coughing, which continued as long as the trachea was open, and seemed to proceed as much from the rushing in of the cool air as from the presence of the instrument. After much time spent in endeavoring to pass the probe, Dr. Atlee determined to hold it there during the paroxysms of coughing, and was surprised to find that its presence did not materially increase the excitement, especially when the fit had been so violent as to induce emesis. He was even able, after an effort of this kind, to carry the instrument down into the left bronchial tube. He also noticed that, when the cough was very severe, the probe, which was five inches and a quarter in length, and properly curved for the occasion, would be drawn down, almost out of his fingers, apparently by the contraction of the muscular fibres of the tube. He, therefore, for the sake of greater security, passed a thread through its eye, and then continued his explorations, but without finding the foreign substance.

The probe was next exchanged for a piece of thick silver wire, upwards of seven inches in length, and bent into a small hook at the extremity. Its passage, at first, excited much coughing, but by

holding it lightly, no injury was produced, and the parts became gradually tolerant of its presence. After having carried it down a distance of five inches and a half, Dr. Atlee encountered some obstacle, which, however, had no particular hardness, like that of a foreign body, and, in endeavoring to get beyond it, there was a sudden and very copious discharge of thick matter, which literally gushed from the wound, and also passed freely into the throat and stomach. The escape of this fluid produced violent coughing at several intervals, each terminating in copious vomiting of the matter previously swallowed. No foreign body, however, could be detected. Several times, after the rupture of the abscess, the hooked probe became fast, apparently in its edges, and was disengaged with some difficulty, but without causing any bleeding. The exploration was continued for half an hour longer, but as nothing further escaped, and as the foreign substance could not be felt, it was abandoned, the wound being kept open, and covered with a piece of gauze. The left side of the chest now sounded less dull on percussion, and the left lung obviously admitted more air; the breathing was less frequent, and there seemed to be little or no exhaustion from the operation.

On the 4th of July, the wound was closed by sutures and adhesive strips, a blister was applied to the chest, and a cathartic administered, the action of which brought away the foreign body, the entire half of the kernel of a hickory nut, weighing three grains and a half. Two days after the operation the pulse was one hundred and twenty, and the patient was harassed with frequent coughing. Soon after this period, the bad symptoms began to diminish, the wound gradually healed, the strength returned, and complete recovery was the consequence.

Case 54.—*Piece of cocoa-nut; girl, between five and six months of age; dyspnœa, cough, and hectic irritation; fruitless exhibition of emetics; tracheotomy upwards of three months after the accident; expulsion of the body in a paroxysm of coughing, six days after the operation; recovery.* (George Bushe, M.D., New York Medico-Chirurgical Bulletin, vol. ii. p. 61, 1832.)

Dr. Bushe saw this patient, for the first time, on the 4th of April, three months after she had inhaled the foreign body. She was feverish and emaciated, experienced constantly more or less dyspnœa, with occasional spasmodic cough, and had a hoarse, feeble

voice. The windpipe was painful, and, when the ear was applied to it, the rustling of the extraneous substance, as the air passed by it, was very audible, particularly when the respiration was at all hurried. Emetics and other means, employed by the family physician, having failed, and the symptoms becoming more and more urgent, the trachea was opened on the 7th of April, with immediate relief of the respiratory distress. As the child was exceedingly weak, no attempt was made to search for the foreign body, which was ejected, six days after the operation, in a fit of coughing. It was a piece of cocoa-nut, about the size of a grain of barley. Rapid recovery ensued.

CASE 55.—*Grain of roasted coffee; girl, aged twenty-two months; useless exhibition of an emetic; ordinary symptoms; body moving up and down the windpipe; tracheotomy nearly three months and a half after the accident; expulsion of the grain of coffee in a fit of coughing; recovery.* (Communicated to the Author by John L. Atlee, M. D., of Lancaster, Pennsylvania.)

A female child, aged twenty-two months, accidentally inhaled a grain of roasted coffee, the presence of which induced immediate symptoms of suffocation, which, however, soon passed off. A physician of the neighborhood administered an emetic, but discouraged an operation. No relief followed, and the child soon became affected with violent paroxysms of cough and difficulty of breathing, which continued until Dr. Atlee saw her, about three months and a half after the accident. Upon examining the chest, it was evident that there was a foreign body in the windpipe, and there were also decided indications of considerable inflammation of the mucous membrane of the trachea and bronchial tubes, the cough being frequent, the respiration hurried, and the mucous râles abundant. The suffering was always aggravated during the night. The parents stated that occasionally, during the cough, a hard substance could be heard striking against the under surface of the larynx.

Tracheotomy being determined upon, the operation was performed by dividing the three upper rings of the tube, nearly three months and a half after the occurrence of the accident. The wound being carefully and steadily held open with blunt-hooks, coughing was excited by the frequent introduction of a probe, in the hope that the foreign body would thus be expelled during a violent expiratory effort, but without success. The wound was also occa-

sionally closed; and, when the child coughed, the sound of a solid body striking against the larynx could be distinctly heard. When opened, however, it could not be seen, having fallen down, probably, into one of the bronchial tubes. A long time was thus consumed, and it seemed to be almost a hopeless and profitless operation. At one period, however, while the wound was firmly closed with the point of the finger, Dr. Atlee distinctly felt the shock of the foreign body against the larynx, and almost instantaneously afterwards the child made an effort to swallow. Not certain whether the substance had passed into the stomach, he spent half an hour more in exploring the trachea before closing the wound. All the symptoms having vanished, a dose of castor oil was administered, and a short time afterwards the coffee-bean was voided by the bowels. A rapid recovery was the consequence.

Case 56.—*Water-melon seed; child, aged seventeen months; cough and strangulation; symptoms of phthisis; tracheotomy at the end of about three months and a half; copious and troublesome hemorrhage; immediate escape of the foreign body; recovery.* (Dr. Henry S. Waterhouse, Philad. Journ. Med. and Phys. Sciences, vol. viii. p. 391, 1824.)

A child, aged seventeen months, while eating some water-melon, on the 3d of August, 1821, drew one of the seeds into her windpipe. The immediate consequences were coughing, strangling, and convulsive efforts, which continued in a very alarming degree for several days, when they became somewhat ameliorated. During the months of September and October, the child suffered everything short of suffocation. At times, the difficulty of breathing was inexpressibly agonizing, and was always attended with fits of coughing, produced, apparently, by the seed being thrown against the glottis. In the earlier periods of the case, hours were sometimes passed in ease and comfort, the respiration being free and natural. The paroxysms usually came on suddenly, during sleep, and so well were the parents acquainted with their character, that they could tell the precise moment when the substance changed its position.

By the early part of November the attacks of cough and strangling had become alarmingly frequent. The cough, indeed, was almost incessant. Symptoms of phthisis supervened; the little patient was rapidly emaciating, the strength failed, the breathing was quick, the skin hot, and the pulse frequent. Dr. Waterhouse

saw the case for the first time on the 14th of November, and on the following morning he opened the trachea. The distance between the thyroid cartilage and the top of the sternum being only about one inch, the operator had to content himself with a very short incision; and, notwithstanding the emaciation, the tube was found to be at least nine lines from the surface. The hemorrhage was dreadful, and this, together with the narrow space in which he had to work, and the cries and struggles of the child, caused no little embarrassment. It was impossible to use ligatures, as the blood issued from innumerable vessels. Compression with the sponge was the only resource, and this was merely palliative. By the time the incision reached the trachea, the bleeding was truly appalling. The blood flowed so rapidly that the operator was obliged, after every attempt to incise the tube, to stop and use the sponge. Finally, however, the canal was opened, but by this time the struggles of the child had ceased, and life was to all appearance extinct. A catheter was now passed into the trachea to inflate the lungs, but to no purpose. The patient was then suspended by the heels, while pressure was made upon the abdomen, to promote the descent of fluids from the lungs, and re-establish respiration. A considerable quantity of blood, froth, and mucus was thus discharged by the mouth and wound. The child being again placed upon the table, the seed appeared at the opening, and was removed with the fingers. After repeated and persevering efforts to renew the respiration, some faint symptoms of returning life were discovered. An hour, however, elapsed from the first sign of resuscitation until the complete re-establishment of the process. Some nourishment was now administered, and the wound dressed with adhesive strips and a bandage. On the fifth day it reopened to the full extent, and was immediately secured in the same manner. The cough and dyspnœa never returned after the operation, and in a short time the child completely recovered.

Case 57.—*Fiddle peg; girl, aged sixteen years; coughing relieved by drink; tracheotomy about four months after the accident; expulsion of the foreign body three months after the operation; recovery.* (Dr. Houston, Dublin Medical Journal, vol. xxv. p. 532, 1844.)

In January, 1844, a girl having a piece of wood in her mouth, permitted it, in a fit of laughing, to fall into the windpipe. The principal symptoms were frequent paroxysms of coughing, which

were particularly severe at night, and a constant mucous râle, with stridulous croupy breathing. The coughing, however, was always relieved by a sup of any liquid. Tracheotomy was performed by Dr. Houston on the 19th of May, but the offending substance did not appear. The operation was followed by the most severe coughing, probably from the accidental intromission of blood into the air-tubes. The body remained in the parts until the month of August, when it was ejected in a violent paroxysm of coughing, and proved to be the wooden peg of a boy's fiddle. After this happy riddance, the girl rapidly recovered, though her general health, it would seem, had never been impaired.[1]

Case 58.—*Stopper of an inkstand; girl, aged eleven years; symptoms at first very mild, then more severe, and ultimately followed by frequent and violent cough, copious expectoration, and inability to breathe, except in the erect posture; tracheotomy six months after the accident; expulsion of the body two months after the operation, in a fit of coughing.* (Dr. Enoch Hale's Descriptive Catalogue of the Anat. Museum of the Bost. Society for Med. Improvement, by Dr. J. B. S. Jackson, p. 118: Boston, 1847.)

The accident happened about the 1st of September, 1835, and was followed by a momentary sense of suffocation, but no other suffering at the time. For some days there was a slight disposition to cough, with other symptoms, which seemed to indicate disorder of the stomach, and which were relieved by an emetico-cathartic. About the 1st of October the respiratory distress returned, lasting several days. Towards the end of the month the girl was seized with what appeared to be typhoid fever, with considerable thoracic difficulty, increased cough, and copious muco-purulent expectoration. The fever subsided in two or three weeks. On the 22d of February, after a violent fit of coughing, she was suddenly attacked with suffocation. At the beginning of each paroxysm the coughing was accompanied by a sound in the trachea, as of the closing of a valve, which was loud enough to be distinctly heard across the room; then followed a suspension of breathing for a time, and a copious expectoration of purulent mucus, with partial relief, until another fit of coughing renewed the distress. An operation was now decided upon, but the child was so feeble that it

[1] Velpeau's Operative Surgery, by Townsend, vol. iii. p. 481.

was feared she would not be able to survive it. For several days she was in a state of great exhaustion; the pulse was from one hundred and forty to one hundred and sixty in a minute, the patient was unable to lie down, and the cough, which was frequent and distressing, was accompanied with copious expectoration.

On the 2d of May, when her health had somewhat improved, the operation of tracheotomy was performed by Dr. J. C. Warren, but without success, as the foreign body did not appear, although the wound was kept open for about a fortnight. Meanwhile, however, she constantly improved in strength, and the suffering became less frequent and violent; she was able to ride and walk, but was subject to dyspnœa on quick motion. Finally, on the 2d of May, about eight months from the time of the accident, and two months after the operation, the foreign body was thrown off in a slight fit of coughing; and from this time she rapidly recovered. It was found to be the stopper of a Wedgewood inkstand, eight lines in length, and five lines in width at its widest part.

Case 59.—*Piece of bone; woman, aged thirty-seven; cough, dyspnœa, and pain in the right side of the larynx; tracheotomy at the end of six months and a half; extraction with the forceps, introduced into the right bronchial tube; recovery.* (Dr. James Duncan, Lond. Lancet, vol. ii. p. 419, 1832–34.)

A woman, aged thirty-seven, was admitted into the Royal Infirmary of Edinburgh, May 12, 1833, under the care of the late Mr. Liston. On the 1st of November, 1832, while eating some mutton broth, a small piece of bone became entangled about the root of the tongue; and in making a violent effort to extricate it by coughing, it was drawn, during an inspiration, into the windpipe. A sense of impending suffocation, a severe fit of coughing, and a sharp pain, referred to the right side of the larynx, about the cricoid cartilage, were the immediate results. In a few minutes the respiration became comparatively easy, and she felt the substance descending the trachea, the pain following it, and leaving the parts where it was first perceived. It appeared to lodge at the upper part of the chest, beneath the right sterno-clavicular articulation, and gave rise to much annoyance, from difficult breathing, accompanied by noisy inspiration, and by a painful sense of rawness when coughing. The dyspnœa continued to be extremely troublesome, and was in-

creased by the least exertion: it was particularly urgent during changeable weather, and her sleep had been all along interrupted by it. From the time of the accident until about three months ago, she had no return of the cough, but about that period, she had, one day, several violent fits, produced, as she supposed, by the presence of a foreign body in the trachea. After this, the dyspnœa became extremely urgent, but she had no further uneasiness from the cough until three weeks since, when it again returned with increased severity, and continued to be very distressing until a few days before her admission into the hospital.

The breathing, at the time of her admission, was noisy and stridulous, especially during inspiration; it was not much hurried, but became so after very slight exertion, even, occasionally, by speaking a few words continuously. The chest all over was natural on percussion, and the vesicular murmur was unattended with any morbid sound, except a little below the sternal end of the right clavicle, where, when the respiration was at all hurried, there was, over a small spot, a pretty loud, sonorous râle. The sound was heard over the superior angle of the right scapula. In other respects, both sides of the chest were perfectly natural, and the respiratory murmur was equal in both. There was no pain, but she felt a sense of rawness in coughing and expectorating. Her sleep is still disturbed by difficulty of breathing. Her sputa are mucous, and occasionally tinged with blood; and in attempting to clear her lungs, she feels a sort of valve-like obstruction a little below the right clavicle. The deglutition is normal. Her general health is not much impaired.

Tracheotomy was performed by Mr. Liston on the 14th of May, and the foreign body (Fig. 45) extracted with a pair of forceps, passed down into the right bronchial tube. The introduction of the instrument excited violent fits of coughing, with heaving of the chest, and lividity of the face. The removal of the bone gave instantaneous relief, the breathing becoming perfectly easy, and the stridulous inspiration entirely ceasing. No untoward symptoms followed the operation, and the patient left the hospital on the 23d of May, as well, in every respect, as she had been before the accident.

Fig. 45.

CASE 60.— *Water-melon seed; girl, aged four years; asthmatic symptoms; fruitless employment of emetics; tracheotomy seven months after the accident; chloroform; expulsion of the substance at the end of forty-seven days, in a paroxysm of coughing; great deformity of the chest; recovery.* (Author.)

Ann D., aged four years, the daughter of a very respectable citizen of Louisville, on the 30th of July, 1851, in eating a piece of water-melon, unfortunately drew one of the seeds into the windpipe. She was perfectly well at the time, and was engaged at the moment in playing and romping with some children. She was instantly seized with violent coughing and symptoms of suffocation, attended with great mental agitation and lividity of the countenance. The paroxysm lasted upwards of half an hour, with hardly any intermission. The suffering then abated; but the cough frequently recurred, sometimes with excessive severity, and was always accompanied with more or less wheezing, which was also apparent in the intervals. A physician who was called in soon after the accident, found the child much exhausted, and immediately administered an active emetic, which was followed by the ejection of a large quantity of water-melon.

The general health remained good, except when the child took cold, to which she was very subject, and which always greatly aggravated her cough and wheezing. At such times there was often considerable fever. Her cough was never absent for a single day; the number of paroxysms varied from three to twelve in the twenty-four hours, and they were almost always aggravated by exercise, as running and jumping, and by mental emotion; they were also generally worse at night. From the constant pulmonary troubles, especially the wheezing and spasmodic cough, she was supposed by her parents, as well as by several intelligent physicians, who saw her during the autumn and winter, to be affected with asthma.

I saw the patient, for the first time, on the 19th of February, 1852, when she was affected with frequent coughing, constant wheezing, and hurried respiration, along with high constitutional excitement. She had just contracted a severe cold, and her asthmatic symptoms, during the last twenty-four hours, had been of the most alarming character. The chest sounded well on percussion, but the ear detected in almost every part a mucous rhonchus, and a loud wheezing noise. The cough was spasmodic, very frequent,

and rather dry; the pulse was accelerated; the face flushed, and the restlessness unusually great. From a careful examination of the facts and circumstances of the case, I expressed my belief to the parents that the suffering was occasioned by the presence of a melon-seed, inhaled the preceding autumn. Under the influence of antimonials, purgatives, and other means, the little patient gradually improved in health, and in a week I discontinued my visits. For the next two days she remained, to all appearance, well, being quite lively and playful.

On Sunday, the 29th of February, however, she was suddenly seized with a most violent fit of coughing, which lasted nearly two hours, and left her in a state of great exhaustion; it was of a convulsive character, and was attended with much wheezing and lividity of the face. In short, it was obvious that, unless prompt relief was afforded, the child could not long survive, while she was in momentary danger of suffocation.

Convinced of the correctness of my diagnosis, I opened the trachea on the 3d of March, assisted by Professor Miller, Dr. Williams, and Dr. Thomson, the latter of whom kindly administered chloroform. The effect of this agent was most happy; it promptly allayed the coughing and dyspnœa, and greatly facilitated the whole operative procedure. Four of the rings of the trachea were divided just below the isthmus of the thyroid body, and the moment the air entered the tube there was the most manifest improvement in the respiration; the chest ceased to heave, and the countenance resumed its wonted hue. As the foreign substance did not appear, search was made for it with the forceps, but the attempt excited so much irritation and spasm that it was obliged to be discontinued. No dressing was applied to the wound, which remained quite open for three weeks, when it began to heal rapidly, and was completely cicatrized in a month. For the first eight days, muco-purulent matter, of a pale-yellowish color, flowed freely through the wound, particularly during coughing, and it continued to be discharged in small quantities up to the time of its closure.

During the whole period which intervened between the operation and the closure of the wound, not one severe paroxysm of coughing took place. The respiration was more or less embarrassed, but the child had some appetite, and was able to sleep well at night. The wheezing continued, and various kinds of noises were heard in the chest, equally on both sides.

The seed (Fig. 46) was not expelled until the 19th of April, when, during a very slight attack of coughing, it was forced, with a considerable quantity of mucus, into the mouth, from which the child withdrew it with her fingers. It was seven lines long, three lines and a half broad, and one line thick, hard and firm, and of a dark-brownish color. The breathing rapidly improved after the ejection of the foreign body; the cough and wheezing soon subsided, and the child regained her flesh and strength.

Fig. 46.

Upwards of two years have now elapsed since the occurrence of the accident, and during that period the chest has undergone a most remarkable change in its shape, owing, mainly, to the great prominence of the sternum.

Although the operation in this case was a failure, as it respects the removal of the foreign body, yet there can be no doubt that it saved the child's life, which, at the time of its performance, was in momentary danger from suffocation.

SECTION II.

CASES OF TRACHEOTOMY, FOLLOWED BY THE DEATH OF THE PATIENT.

The cases included in this section are, as will be perceived by a reference to the accompanying table, eight in number. Comparing them, in this particular, with those related in the preceding section, we must adopt one of two conclusions, either that the unsuccessful cases are much less numerous than the successful, or that surgeons do not report the former as frequently as the latter. The question is undoubtedly a most important one, but, unfortunately, we have no reliable data for its solution. Nevertheless, I am satisfied, from the facts before the profession, that bronchotomy, properly performed, is, in general, a perfectly safe procedure, well calculated to place the respiratory organs in a condition favorable to the prompt expulsion of the foreign body, and rarely followed by fatal results. The circumstance that the extrusion is occasionally delayed until after the cicatrization of the wound, does not at all invalidate this opinion; for such an occurrence, although not uncommon, is far

less frequent than the immediate, early, or timely ejection of the substance.

Of the patients, whose cases are recorded in this section, five were males and two females, the sex in one not being specified. The ages, mentioned in six of the cases, varied from two years, the youngest, to forty-four, the oldest. The foreign substances were a piece of sponge, two beans, a head of timothy, a grain of corn, a herring-bone, and two pebbles. Emetics and other means were employed in three of the cases, and in one the body was inverted. Tracheotomy was performed, in two of the cases, the day after the accident; in one, at four days; in one, at the end of a week; in one, on the tenth day; in one, in three weeks; and in one, on the twenty-second day: in one, the time is not specified. In one of the cases the patient was nearly asphyxiated in the operation by the entrance of blood into the trachea. The time of death after the operation was as follows: in one, immediately; in one, in forty hours; in one, in fifty-three hours; in one, after some days; in one, in ten days; in one, in twenty days; and in one, in eight months: in one, the time is not mentioned. In three of the cases, the extraneous substance was expelled or extracted immediately; in five, it was retained, twice in the left bronchia, once in the right bronchia, and once in the ventricle of the larynx; the seat in the other case not being specified.

The following cases, the history of which is imperfect, are not included in the table.

While Ferrand was Surgeon-in-chief to the Hôtel Dieu at Paris, a man was admitted into that institution on account of threatened suffocation from the effect of a stone which had slipped into his windpipe. Tracheotomy was performed, but nothing escaped, except blood and mucus. Death occurred a short time after; and on dissection a piece of stone, of a triangular shape was found in one of the ventricles of the larynx, with one of its ends projecting through the glottis.[1]

Some years ago, Mr. R. W. Smith,[2] of Dublin, examined the larynx of a child, six years of age, whose trachea had been opened on account of a brass nail, such as upholsterers use in covering

[1] Desault's Surgical Works, translated by Smith, vol. i. p. 236. Phil. 1814.

[2] London Lancet, vol. ii. p. 76, 1844.

chairs. When the little patient reached the dispensary he was in a state of suffocation. Every means was employed, but without success, for his relief. No inspiration followed the operation, although inflation of the lungs was promptly resorted to. The nail was found in one of the ventricles of the larynx with its head downwards below the glottis.

A child, two months old, having inhaled a bean, was tracheotomized, but too late to do any good, as he died soon after. At the autopsy, the foreign body was found at the bifurcation of the bronchial tubes, somewhat swollen, and surrounded by pus and lymph. The lungs were hepatized. The slightest movement of the body always produced a paroxysm of suffocative cough. Leeches, an emetic, and blisters, had been employed previously to the operation.[1]

Professor Watson, of Nashville, had a case, in which he opened the trachea on account of the presence of the ferule of the rib of an umbrella, containing a piece of whalebone. He did not see the patient until eight days after the occurrence of the accident; the operation was then performed, and a portion of the whalebone extracted with the forceps; but all attempts to remove the ferule failed, and the case terminated fatally.[2]

[1] New York Journal of Med. and the Collateral Sciences, July, 1844, p. 133.

[2] Eve, Nashville Journal of Medicine and Surgery, vol. v. p. 140. 1853.

TABLE OF CASES OF TRACHEOTOMY, FOLLOWED BY DEATH.

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	PREVIOUS TREATMENT.	TIME OF OPERATION.	ACCIDENTS.	TIME AND MODE OF EXPULSION.	OPERATOR.	AUTHORITY.
1	Piece of sponge	Male	44 yrs.	Not very urgent after first few minutes, but becoming so afterwards; diminution of respiratory murmur in right lung.	Emetics and tickling of the fauces	Day after	Entrance of blood into windpipe; death 53 hours after operation	Immediately; with the forceps.	Dr. Dixi Crosby	Dr. E. R. Peaslee, N. Hampshire Journ. of Med., ii. 197, 1852.
2	Bean	Female	11 yrs.	Violent cough, dyspnœa, and inability to lie down.		Day after	Death on 10th day after operation	Retention in right bronchia.	Dr. G. McClellan	Author.
3	Bean	Male	5 yrs.	Violent suffocative distress, with convulsions, during last 36 hours.		4 days	Death 40 hours after operation	Immediately; spontaneously.	P. J. Pelletan	Clinique Chir., i. 2, Paris, 1810.
4	Head of timothy	Male		But little cough after first attack; pain and uneasiness in the trachea, opposite top of sternum.		1 week	Death after wound had healed, from pulmonary disease	Retention.	Dr. S. Annan	American Med. Recorder, vii. 42, 1824.
5	Grain of corn	Male	5 yrs.	Mild at first, but urgent cough and dyspnœa afterwards; body shifting from one bronchial tube to the other.	Emetics and other means	10th dy.	Death on 20th day from pulmonary disease	Retention in left bronchial tube.	Author	Author.
6	Herring-bone		2 yrs.	Croupy cough; great dyspnœa; suffocative symptoms from least exertion.		3 weeks	Death immediately after operation	Retention in ventricle of larynx.	Dr. R. T. Evanson	Dublin Journal Med. and Chem. Sci., v. 27, 1834.
7	Pebble	Female	12 yrs.	Violent and continual cough, followed by phthisis.	Emetics, bleeding and expectorants	22d day	Death at 8 months from pulmonary disease	Immediately; spontaneously.	P. J. Pelletan	Clinique Chir., i. 10, Paris, 1810.
8	Pebble	Male		Severe cough on moving about; inability to lie on left side; change of foreign body from right to left bronchia.	Inversion of the body		Death some days after operation	Retention in left bronchial tube.	Mr. S. Solly	London Lancet, i. 480, May 5, 1849.

NARRATIVE OF CASES OF TRACHEOTOMY, FOLLOWED BY DEATH, AND MENTIONED IN THE TABLE.

CASE 1.—*Piece of sponge; man, aged forty-four years; tracheotomy the day after the accident; partial asphyxia from the entrance of blood into the windpipe; immediate extraction of the foreign body with the forceps; death fifty-three hours after the operation; post-mortem examination.* (Dr. E. R. Peaslee, New Hampshire Journal of Medicine, vol. ii. p. 197. 1852.)

The subject of this case, one of the most remarkable upon record, was John A. Dobie, aged about forty-four years, a well-made, robust man, a bookbinder and bookseller, who was in the habit of introducing, several times a day, a piece of moistened sponge into his nose to remove the fetid secretion attendant upon a scrofulous ulcer of the nasal septum. On the 23d of July, 1850, while applying the sponge as usual immediately after dinner, he accidentally let it slip from his fingers, and it passed back at once through the posterior nares. A paroxysm of coughing and considerable dyspnœa instantly ensued; but these symptoms soon subsided, the breathing becoming much easier, and the spasmodic action nearly entirely disappearing. The throat and pharynx were carefully explored, at first with the finger, and afterwards with the forceps, without encountering the foreign substance, which the patient declared he could perceive successively in these situations. The fauces were then tickled with a feather, and, finally, an emetic of ipecacuanha was administered, with no better effect. The emetic acted in fifteen minutes, forcing up the fluid contents of the stomach to a considerable distance, in a small stream. Notwithstanding this, the difficulty of breathing at once returned, and the patient declared he could again feel the sponge at the bottom of the pharynx; where, however, a second introduction of the long forceps failed to discover it. An œsophageal bougie was next conveyed into the stomach, without meeting with any obstruction, except what was produced by a slight spasmodic contraction of the tube. The man now again breathed quietly, and asserted that he could feel the sponge in his stomach. A single "hack," however, was occasionally heard, and served to keep alive the suspicions of the medical attendant.

During the afternoon the cough and dyspnœa returned; but the

man passed the night in tolerable comfort until three o'clock in the morning, when, in consequence of a conversation with his attendant, another paroxysm was produced; which, however, soon subsided. Dr. Peaslee could now discover that, during the paroxysm, expiration was much more difficult than inspiration; while, in the intervals, inspiration was the more difficult. Previously to this period, there was no perceptible difference in the two movements. This circumstance suggested the idea that the sponge was raised by the cough against the larynx, and that it fell backwards towards the bifurcation of the trachea afterwards; but its precise location could not be detected by the ear placed over the tube or the chest.

Dr. Peaslee saw the patient at seven o'clock the morning after the accident, when he learned that there had been no paroxysm since three o'clock the previous night. The respiratory murmur was now found to be diminished throughout the whole of the right lung, and the corresponding side of the chest was also evidently less distended on inspiration than the other; the sponge having probably at length become fixed in the right bronchial tube.

Tracheotomy was performed towards noon by Professor Crosby. The parts became immediately obscured by blood, which was drawn through the wound at every inspiration, until it filled the tube from the sponge to the artificial opening, and completely asphyxiated the patient. In the mean time, several attempts were made to extract the sponge with a pair of long forceps, but without success. Dr. Peaslee now rapidly cleared away the blood with a pellet of cotton, and then introducing the forceps, brought up a piece of sponge about the size of a pea. A second effort produced no better result, so firmly did the mass appear to be impacted; a third was then made, and the whole sponge, except a very small fragment, was seized and extracted. Still, the man did not breathe; but, after applying the usual means for exciting the respiratory movements, he at length gasped, and in a few minutes was able to answer questions.

The sponge was even larger than the patient had represented. Another piece, cut out as a *fac-simile* of it, but found on accurate comparison to be somewhat thinner and smaller, was, when moistened, $1\frac{3}{4}$ inches long, $1\frac{1}{4}$ wide, and $\frac{5}{16}$ of an inch thick; and all this exclusive of the three small fragments detached from the original, as previously stated. Fig. 47, represents the horizontal, and Fig. 48, the vertical outline of the sponge.

In less than half an hour after the wound was closed, the man appeared to be dying. He breathed with greater difficulty than

Fig. 47.

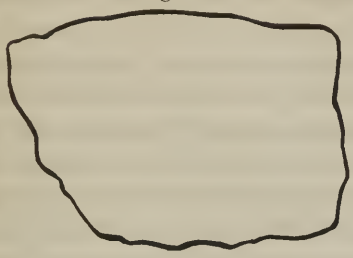
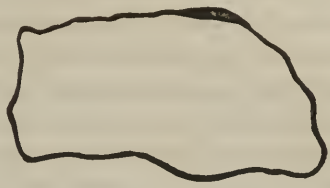


Fig. 48.



before; he was livid and insensible, and his neck was swollen out almost to a level with the chin, from the combined effects of emphysema and hemorrhage. The wound being reopened, and the trachea tickled with a probe, about four ounces of fresh blood were expelled from the tube, to the evident advantage of the respiration. A canula was then introduced into the trachea, and frequent attempts made to aid the man, who was all this time in a semi-comatose condition, in expelling the blood which still remained in the bronchial tubes. His death occurred on the afternoon of the 26th of July, about fifty-three hours after the operation.

The larynx was normal, large, and well-proportioned. The trachea was inflamed throughout. A patch of lymph, about an inch in extent, existed just above the bifurcation of the bronchial tubes, and served to retain a fragment of sponge about the size of a common white bean. So intimate was the union between these two substances that the one could not be detached without the other. The upper lobe of the right lung was inflamed, while the rest were extensively congested. The bronchial tubes contained a large quantity of bloody mucus. The lower lobe of the left lung was also inflamed, but the remainder of the organ was healthy. None of the other viscera were examined.

Case 2.—*Kidney-bean; girl, aged eleven years; violent cough, dyspnœa, and inability to lie down; tracheotomy the day after the accident; death on the ninth day after the operation; foreign body in the right bronchial tube.* (Author.)

A girl, aged eleven years, the daughter of a livery-stable keeper, named Hunt, in May, 1827, while amusing herself with

some kidney-beans, let one of them fall into her windpipe. Violent cough, dyspnœa, and inability to lie down, were the prominent symptoms of the case. The family physician, the late Dr. George McClellan, of Philadelphia, who saw her soon after, performed tracheotomy the following day, but was unable to extract the foreign body, although he repeatedly introduced his forceps for that purpose. A pair of silver hooks being secured in the wound, to keep it as patulous as possible, the girl was left to the care of her family in the hope that spontaneous expulsion would take place. Unfortunately, however, this did not occur, and, after suffering from a severe attack of pneumonia, she expired on the tenth day after the accident and the ninth after the operation. Upon dissection of the body, Dr. Sharp and myself, who were present at the operation, and attended the case during Dr. McClellan's absence from the city, found the bean in the right bronchial tube, just below the bifurcation of the trachea, softened and considerably swollen from its sojourn in the midst of the sero-mucous fluid which filled that portion of the canal. The pulmonary tissues and mucous membrane around were in a state of high inflammation.

Case 3.—*Kidney-bean; boy, between five and six years old; violent suffocative symptoms; tracheotomy at the end of four days; death forty hours after the operation.* (P. J. Pelletan, Clinique Chirurgicale, t. i. p. 2. Paris, 1810.)

A child between five and six years of age, inhaled a kidney-bean, followed by the most violent suffocative symptoms, which had continued for four days when he was seen by Pelletan. During the last thirty-six hours convulsions had made their appearance. Although the patient was nearly moribund, his surgeon determined to open the trachea, and hardly had he done so before the bean (Fig. 49) was ejected with a loud noise to the distance of two feet. For a moment the child was thought to be dead, but he gradually revived, and called for his playthings. At ten o'clock in the evening the convulsions reappeared, and he expired forty hours after the operation. The vessels of the brain were excessively engorged with blood, notwithstanding which the child experienced remarkable relief immediately after the expulsion of the foreign body. Pelletan thinks that the operation would have been successful if it had been performed earlier.

Fig. 49.

Case 4.—*Head of timothy; young man; tracheotomy at the end of a week; retention of the foreign body; abscess in the lungs; death.* (Dr. S. Annan, Amer. Med. Recorder, vol. vii. p. 42, 1824.)

On the 22d of August, 1822, Dr. Annan was consulted by a young man, who, while pitching hay, had in his mouth a head of timothy, which passed into the trachea, the stem presenting downwards and the spicula upwards. The accident had happened about a week before. There was but little cough, but the patient complained of pain and uneasiness in the windpipe, opposite the upper part of the sternum. Tracheotomy was performed, but every effort to remove the foreign body proved ineffectual. The wound soon healed; inflammation of the lungs came on; abscess after abscess formed, and burst as low as the fifth rib; the grass retained its position; and the man sunk under the discharge and irritation. It is to be regretted that the reporter of this interesting case has not stated the time which elapsed between the accident and the fatal termination.

Case 5.—*Grain of corn; boy, aged five years; convulsive cough and dyspnœa, followed by fever and pneumonia; emetic and other means; tracheotomy on the tenth day; death on the twentieth day after the accident; foreign body contained in the left bronchial tube.* (Author.)

William R., aged five years, while at play in the afternoon of the 9th of July, 1847, accidentally drew into his windpipe a grain of corn. A violent suffocative paroxysm with partial insensibility was the immediate consequence. My colleague, Professor Miller, who saw the child soon after the accident, administered a strong emetic, which produced copious vomiting, and greatly relieved the symptoms, though the respiration remained somewhat noisy and embarrassed. Next morning, he had a severe spasm of coughing, but soon recovered, and continued comfortable during the rest of the day, playing about as usual. Another paroxysm occurred at midnight, and on the following night he was feverish and much harassed by coughing. From the 12th to the 18th, he became gradually weaker, and the pulmonary suffering increased in severity. On the 19th, I performed tracheotomy, in the usual manner, but did not succeed in finding the foreign body, although I searched for it several times with a pair of very long, slender forceps. Keeping the wound open, the child was placed in bed, and treated antiphlogistically. Although the operation had the effect of reliev-

ing the urgent symptoms, the improvement was of a transient character, and the case went on gradually from bad to worse, until the 20th day after the accident, when the boy expired. It should have been stated that emphysema of the neck supervened within a few minutes after I had opened the trachea; it was, however, comparatively slight, and manifested no disposition to spread beyond a few inches. It had nearly entirely disappeared by next morning.

A week having elapsed since the accident when I first saw this case, no very satisfactory information could be obtained as to the location of the foreign body from auscultation and percussion. It was evident that great obstruction existed in both lungs, but it was impossible to determine whether this was occasioned by the hepatized condition of the pulmonary tissues, or the mechanical impediment occasioned by the presence of the grain of corn. From the *post-mortem* appearances, it is highly probable that it was originally lodged in the right bronchial tube, from which it afterwards fell into the left, where it was found at the time of the dissection.

Fig. 50.

The examination was made ten hours after death, in the presence of Professor Miller, Dr. Richardson, and Dr. Bozeman. The corn was found in the left bronchial tube, more than an inch from the bifurcation of the trachea; it was considerably swollen, and the large end, which presented upwards, was much softened. The mucous membrane around was unnaturally red, but not materially changed in any other respect. In the right bronchial tube, a short distance from its origin, was an ulcer, corresponding, in size and shape, with the corn, by the lodgement and impaction of which it had, no doubt, been occasioned. From the comparatively sound appearance of the other tube, there was, as already stated, every reason to conclude that the foreign substance had changed its position only a short period before death, having probably passed over to the left side during a fit of coughing. The mucous membrane of the trachea and of the right bronchial tube was abnormally red, and a number of the smaller canals were considerably dilated. The right lung was extensively solidified, the inferior and a portion of the middle lobe being infiltrated with pus and sero-sanguinolent fluid. The disease, on the left side, was nearly equally diffused, but less advanced, except in the lower lobe, which was hepatized almost throughout, more or

less softened, and interspersed with minute purulent deposits. Altogether the evidences of pneumonia could not have been more distinctly defined in any case. The wound in the trachea was still open, its edges presenting a raw, ulcerated appearance.

Case 6.—*Piece of herring-bone; child, aged two years; croupy symptoms; tracheotomy three weeks after the accident; death immediately after; foreign body in the ventricle of the larynx.* (Dr. R. T. Evanson, Dubl. Journ. Med. and Chem. Scien. vol. v. p. 27. 1834.)

A child, about two years old, was suddenly seized with a paroxysm of coughing, followed by stridulous breathing, and so much dyspnœa, as to threaten instant suffocation. The case was treated as one of croup, which, in fact, it much resembled. Some relief followed, but similar paroxysms recurred from day to day, and became more alarming on each repetition. Dr. Maunsel, who saw the child about ten days after the first attack, and who communicated the particulars of the case to Dr. Evanson, found the breathing permanently stridulous, and the fits of suffocation excited by the slightest exertion; there was, also, much debility. Upon inquiry, it was ascertained that, at the moment of the first seizure, the child had been sitting upon the knee of one of the servants, while the latter was dining on fish. From a consideration of these circumstances, the existence of a foreign body was suspected; and, at length, at the end of about three weeks, tracheotomy was performed; too late, however, to do any good, for the child expired immediately after. A portion of herring-bone was discovered in the ventricle of the larynx.

Case 7.—*Pebble; girl, aged twelve years; cough and other pulmonary symptoms; emetics; tracheotomy on the twenty-second day; immediate ejection of the foreign body; death at the end of the eighth month from the accident, from pulmonary disease.* (P. J. Pelletan, Clinique Chirurgicale, t. i. p. 10. Paris, 1810.)

A girl, aged twelve years, playing with some pebbles, threw them into the air, and let them fall into her mouth. One of them entered the windpipe, inducing violent and continual cough. A physician, who was called in soon after, treated the case as one of pulmonary catarrh; but after numerous bleedings, emetics, pectoral drinks, and blisters had been employed for twenty-two days, it was found that

Fig. 51.

there was no amelioration of the cough and other symptoms. Pelletan being sent for, immediately performed tracheotomy; but the foreign body did not present itself at the wound, though the patient could feel it passing up and down the canal. He now made her lie flat on her back and side, when the pebble (Fig. 51) was suddenly ejected with a loud noise. It was very smooth, rounded, and of an elongated conical figure.

The success of the operation was only momentary; the cough continued, the sputa became purulent, and the wound was two months in healing, owing to the excessive emaciation of the patient. Death occurred from pulmonary disease at the end of eight months from the accident, and five months and a half after the cure of the wound from the operation.

Case 8.—*Pebble; man; inability to lie on the left side; situation of the foreign body, at first, in the right, and afterwards in the left bronchial tube; ineffectual inversion of the body; tracheotomy; death several weeks after the operation; inflammation of the left pleura, and abscess in the right lung; discovery of the pebble in the left bronchial tube.* (Mr. Samuel Solly, London Lancet, vol. i. p. 480, May 5, 1849.)

In this case, the patient drew into his windpipe a pebble which he had placed under his tongue to allay his thirst, while working on the railway. He applied, soon after the accident, to a surgeon in the neighborhood, who, after making him stand on his head, and taking other measures for relieving him, proposed tracheotomy, to which, however, the man objected. On his admission at St. Thomas's Hospital, Mr. Solly found that, when recumbent, and entirely at rest, he was free from cough, and unconscious of the presence of the stone; but severe cough was induced if he moved about much, and he fancied that the foreign body changed its position. Every attempt to turn on the left side produced great dyspnœa, with cough and impending suffocation, and he consequently lay either on his back or right side. From his feelings, the patient supposed that the pebble occupied the right bronchial tube, and he referred to a particular point of that tube as the occasional seat of a sore and prickling sensation. The respiratory murmur on the left side was rather loud, but otherwise natural; on the right side there was a peculiar cooing sound, about four inches beneath the clavicle, and

below this point, over a space of about three square inches, the respiratory murmur was entirely wanting. These signs, however, varied, and, at times, the sound accompanying the ingress of air could be distinguished at every part of the chest.

After the patient had been in the hospital a few days, he was bound, inverted, to a table, the operator frequently striking him with his hand on the chest and back. The dyspnœa and spasmodic cough, however, forbade the maintenance of this position beyond forty or fifty seconds. This mode of procedure having produced no effect upon the position of the pebble, the trachea was next opened, and the man again inverted, without any better result. Severe bronchitis ensued, and was twice subdued by repeated cupping, and the use of mercury. At last, the patient suddenly left the hospital, and died eight days after. Six days before this event, he was seized with a violent fit of coughing, in which he was nearly suffocated, and in which he thought he felt the stone change its position. The expectoration was very copious the last week of his life, and he had three convulsions shortly before his death.

An examination of the body revealed extensive inflammation and suppuration in the pleura on the left side, and an abscess in the substance of the lung on the right side. The pebble, which weighed one hundred and fourteen grains, and which measured three-quarters of an inch in its long axis by half an inch in the short, was firmly wedged in one of the first divisions of the left bronchial tube; but there was no ulceration of the mucous membrane around it, indicating that it had been long resident there.

From the history of the case, and the morbid appearances, Mr. Solly is of opinion that the stone was ejected from its original position when the fit of spasmodic coughing came on, two days after the man left the hospital, and that it immediately after passed into the left bronchial tube, where it was found after death. He observes that he had been prepared to use forceps for the extraction of the substance, but that the introduction of a long steel probe occasioned such violent spasm, without affording any evidence as to its situation, that he did not consider himself justified in employing them. It is to be regretted that the history of this case is so defective in regard to its chronology.

CHAPTER XII.

LARYNGO-TRACHEOTOMY.

SECTION I.

CASES OF LARYNGO-TRACHEOTOMY, FOLLOWED BY THE EXPULSION OF THE FOREIGN BODY, AND THE RECOVERY OF THE PATIENT.

THE operation of laryngo-tracheotomy consists, as has been already seen, in making the opening for the removal of the extraneous body partly into the larynx and partly into the trachea. It is a kind of compound procedure, commenced occasionally in the one, and sometimes in the other of these portions of the windpipe, the surgeon, perhaps, not intending, at the moment, to interfere with more than one, but finding it necessary, as he proceeds, to divide both.

The cases included under this division of the subject are ten in number. Of these five were males, and five females. The ages were, respectively, four, five, six, six and a half, seven, eight, nine and a half, ten, eleven, and twenty-four years. The foreign bodies were a grain of corn, bone, plum-stone, almond-shell, glass bead, water-melon seed, bean, pebble, grain of coffee, and a button-mould. The previous treatment is stated in only five of the cases, in four of which it consisted of emetics, and in the other of emetics, errhines, and other means. The time at which the operation was performed, after the occurrence of the accident, was, in one "soon," in three the "day after," in two several days, in two on the fifth and ninth day, respectively, in one in five weeks, and in one in six weeks.

In one of the cases, that of Dr. W. H. Mussey, swooning and asphyxia occurred during the operation, and it was necessary to employ artificial respiration to revive the patient. In three, hemor-

rhage took place; in one to such an extent as to compel the operator to desist from further proceedings until two days after.

The time which intervened between the operation and the removal of the substance was as follows: in four immediately, in three "soon after," in one in two hours, in two on the next day, and in one on the third day. The mode of extrusion was, in four cases, with the forceps, in one with the probe, in one by coughing, in one by a violent expiratory effort caused by irritating the nose, in one by sneezing, and in two spontaneously. In one of the cases no mention is made of the circumstance.

The symptoms varied so much as to render precise analysis almost impracticable. In several of the cases they were very alarming. In two there was aphonia, dependent, in one certainly, and probably also in the other, upon the presence of the foreign body in the larynx. In one, the voice was altered and hissing, although the substance was moving up and down the windpipe. In another case, in which the body was likewise loose, there was a shrill, croupy cough. In the case of Pelletan, the patient referred most of his distress to the larynx, in which the extraneous substance, a button-mould, was lodged. In Dr. Morehouse's case there was not only aphonia, but a whistling sound in the larynx, and feeble respiratory murmur in both lungs. In one of the cases there was hectic fever, although the foreign body was removed at the end of five weeks.

TABLE OF CASES OF LARYNGO-TRACHEOTOMY, FOLLOWED BY THE EXPULSION OF THE FOREIGN BODY AND BY THE RECOVERY OF THE PATIENT.

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	PREVIOUS TREATMENT.	TIME OF OPERATION.	ACCIDENTS.	TIME AND MODE OF EXPULSION.	OPERATOR.	AUTHORITY.
1	Grain of corn	Male	8 yrs.	Very alarming, as denotive of suffocation.		Soon		Immediately.	Dr. Abner Hopton	American Journ. Med. Sciences, iv. 534, 1829.
2	Bone	Male	7 yrs.	Aphonia, excessive dyspnœa, and great prostration; asphyxia during operation, and artificial respiration.		Day after	Swooning and asphyxia; artificial respiration	Third day; by coughing.	Dr. W. H. Mussey	Western Lancet, Nov. 1853.
3	Plum-stone	Female	6½ yrs.	Altered and hissing voice; but little cough; substance passing up and down windpipe.	Emetics	Day after		Soon after; by violent respiratory effort, caused by irritating the nose.	Dr. A. R. P. Duchateau	Nouveau Journal de Méd.; New York Med. Repository, N. S., vi. 235, 1821.
4	Almond-shell	Female	10 yrs.	Great dyspnœa, and loss of voice; asthmatic breathing; feeble respiratory murmur on both sides; whistling sound in larynx, and incessant cough.		Day after		Day after; with the forceps.	Dr. G. R. Morehouse	Philadelphia Med. Examiner, April, 1852.
5	Glass bead	Female	5 yrs.	Violent cough; great wheezing; pricking pain in the neck; comparative ease when quiet.	Emetic	2 days	Hemorrhage	Soon after; spontaneously.	Baron Boyer	Journ. Hébdomadaire de Médecine, ii. 268, 1829.
6	Watermelon seed	Male	4 yrs.	Dyspnœa, and shrill, croupy cough; body moving up and down windpipe.	Emetics	Several days	Profuse hemorrhage	Soon after; with the forceps.	Dr. S. A. Cartwright	New England Journal Med. and Surg., xiv. 135, 1825.
7	Bean	Male	9½ yrs.	Ordinary, but violent and persistent.	Emetics, errhines, and other means	5th day	Hemorrhage	Two hours; by sneezing.	Baron Boyer	Traité des Malad. Chir., v. 502, 1846.
8	Pebble	Female	11 yrs.	Severe cough and suffocative symptoms, followed by great abatement; a peculiar noise in coughing, and great oppression in chest.		9th day		Next day; with the probe.	Dr. H. G. Jameson	Amer. Med. Recorder, vii. 36, 1824.
9	Grain of coffee	Female	6 yrs.	Ordinary, followed by hectic fever.	Emetics	5 weeks		Immediately; spontaneously	Dr. Mount	Dr. D. Drake, Western Journ. Med. and Phys. Sci., ii. 341, 1837.
10	Button-mould	Male	24 yrs.	Ordinary, with distress in larynx, in which the body was lodged.		6 weeks		Immediately; with the forceps.	P. J. Pelletan	Clinique Chirurg., i. 8, Paris, 1810.

NARRATIVE OF CASES OF LARYNGO-TRACHEOTOMY, FOLLOWED BY THE EXPULSION OF THE FOREIGN BODY AND BY THE RECOVERY OF THE PATIENT.

Case 1.—*Grain of corn; lad, aged eight years; laryngotomy first, and immediately after tracheotomy; prompt removal of the foreign body; recovery.* (Dr. Abner Hopton, Amer. Journ. Med. Sciences, vol. iv. p. 534. Phil. 1829.)

A boy, eight years old, accidentally inhaled a grain of corn, followed instantly by the most alarming symptoms of suffocation. Laryngotomy was promptly performed, but the aperture thus made was found to be too small to admit of the extrusion of the foreign body; and Dr. Hopton, therefore, determined at once to open the trachea instead of dividing the cricoid cartilage and the isthmus of the thyroid gland, which, as he supposed, might endanger the superior thyroid artery, and thus occasion a troublesome hemorrhage. The grain of corn was now removed without any further embarrassment, and the patient speedily recovered.

Case 2.—*Piece of bone; boy, aged seven years; violent cough, dyspnœa, and aphonia; laryngo-tracheotomy the day after the accident; artificial respiration; use of a canula; expulsion of the body at the end of the third day in a fit of coughing; recovery.* (W. H. Mussey, M. D., Western Lancet, November, 1853.)

John Wildey, aged seven years, on the 8th of August, while eating soup, was seized with a violent fit of coughing, which was followed by great difficulty of breathing and inability to speak above a whisper. When first seen by Dr. Mussey, twenty-two hours after the accident, he was greatly prostrated, and the countenance had an anxious, livid appearance. The symptoms being in every respect most urgent, laryngo-tracheotomy was promptly resorted to, but before the windpipe could be opened the patient swooned twice. The cricoid cartilage and two rings of the trachea were divided, but the admission of air to the lungs did not produce reaction. Separating the edges of the wound with a bivalve speculum, the operator found that the windpipe was loaded with mucus, which, along with a considerable quantity of blood, he immediately removed by suction with his own mouth, and then, as there was no improvement, he introduced a silver tube,

and proceeded to inflate the lungs with his own breath, taking care, from time to time, to expel the air from the chest by means of pressure. After five minutes the respiration appeared to be voluntary; but, as it soon flagged, it became necessary to continue the artificial efforts for half an hour longer, when consciousness was fully re-established. Various stimulants were applied, meantime, to the external surface.

The larynx was next thoroughly explored with a probe, armed with a couple of threads and pieces of sponge; but, nothing being found, the canula was replaced, and the patient taken to his lodgings. Twenty-eight hours after the operation, he complained of pain in the right side of the neck, particularly on a level with the thyroid cartilage, where there was considerable tumefaction. For the relief of this pain five leeches were applied. So abundant was the secretion of mucus for two days, that it was necessary to remove the canula every six or eight hours to clean it, and to exercise the patient in coughing to clear the bronchial tubes. On one of these occasions, about three days after the accident, the foreign body was ejected, in a fit of coughing, at the artificial aperture. It proved to be a piece of bone, sharp at the edges, thin, thirteen-sixteenths of an inch in length, and half an inch in width at its widest part. The secretion of mucus rapidly diminished, and on the fourth day the canula was removed; the boy could speak audibly on the fifteenth day; and the wound was entirely cicatrized by the end of the fifth week after the operation.

Case 3.—*Plum-stone; girl, aged six years and a half; altered and hissing voice; fruitless vomiting; laryngo-tracheotomy the day after the accident; ejection of the intruded substance soon after, during a violent expiratory effort, caused by irritating the nose; recovery.* (Dr. A. R. P. Duchateau, Nouveau Journal de Médecine; New York Medical Repository, N. S., vol. vi. p. 235, 1821.)

On the evening of the 23d of November, 1815, a girl, six years and a half old, swallowed, whilst playing with her companions, a plum-drupe. Dr. Duchateau, who was immediately sent for, found her laboring under inexpressible anxiety, with an altered and hissing state of the voice. But little cough was present; the chief distress was seated at the upper and lateral part of the chest; and at each strong expiration the foreign body could be heard to strike against the glottis. Ten grains of ipecacuanha being administered,

free vomiting was produced, without the desired result. The child was now greatly fatigued, and, falling asleep, remained tranquil until four o'clock in the morning. On awaking she became agitated, convulsed, and extremely feeble. At seven o'clock, she was unable to articulate, senseless, and in every respect in the most unpromising condition. The windpipe was now opened by dividing the crico-thyroid ligament, the cricoid cartilage, and three of the rings of the trachea. The moment the larynx was penetrated, the air rushed out with force, and the drupe struck the point of the knife. After waiting a short time it again presented itself at the opening, but could not be extruded, owing to the feebleness of the expiration. An attempt was then made to seize it with the forceps, but this also failed; the larynx was explored with no better success. The child now appeared to be almost on the point of expiring. While Dr. Duchateau was deliberating what to do, an irritation, excited in the nose, produced violent action of the respiratory organs, in which the offending body was thrown out by a strong expiration, and bounded on the floor. All the unfavorable symptoms immediately vanished; and the wound, dressed with adhesive strips, was completely cicatrized in a fortnight. The drupe was nine lines in length, four and a half in breadth, and two and a half in thickness.

Case 4.—*Piece of almond-shell; girl, aged ten years; cough, dyspnœa, and loss of voice; laryngo-tracheotomy the day after the accident; subsequent division of the thyroid cartilage; immediate removal of the foreign body from the larynx with the forceps; etherization; recovery.* (Dr. G. R. Morehouse, Philadelphia Medical Examiner, April, 1852, p. 215.)

On Wednesday, February 26, a girl, aged ten years, while laughing and romping with her school-fellows, drew into her larynx a piece of almond-shell, which she had been holding in her mouth. She was immediately seized with a prolonged paroxysm of coughing, followed by dyspnœa and loss of voice. These symptoms gradually increased, and the next day the child was in the greatest danger of strangulation. The respiration was with difficulty maintained, and was accompanied with a wheezing sound similar to that heard in asthma, although much more feeble. She complained of no pain, except when lateral pressure was made on the larynx. The respiratory murmur, scarcely discernible, was free alike in both lungs;

there was no rattling noise to indicate the presence of a loose body in the trachea. Over the larynx, however, a whistling sound, as of a person blowing through a quill, was distinctly audible. These facts, therefore, together with the incessant cough, the dyspnœa, the pain on pressure, the whispering voice, and the whistling sound of constriction, all pointed to the ventricles of the larynx as the position occupied by the foreign body.

Ether having been administered, an incision, nearly three inches in length, was made along the middle line; the isthmus of the thyroid body was separated from its attachment, and the plexus of thyroid veins was pushed aside by the handle of the scalpel. The knife was then entered just below the crico-thyroid artery, dividing, as it was withdrawn, the cricoid cartilage and the three upper rings of the trachea. The relief was immediate and most gratifying. The oozing having ceased, an attempt was made to carry an instrument through the rima of the glottis, in the hope of extracting the shell; but such was the tumefied condition of the parts that this was quite impracticable. The child being greatly exhausted, a conical curved tube, flattened laterally, was inserted into the windpipe, and secured to the neck. She was then put to bed, and took an anodyne.

On the following morning, the symptoms were propitious. The œdema had greatly subsided, though the vocal chords were apparently in as close proximity as ever. The thyroid cartilage was now divided, when, upon pressing the opposite sides asunder, the piece of shell came into view as it lay in the left ventricle of the larynx, and was readily extracted with a pair of polypus forceps. The tube was permitted to remain until the swelling had subsided, when the edges of the wound were closed with adhesive strips. A rapid recovery followed.

Case 5.—*Glass bead; girl, five years old; violent cough, singular wheezing noise, and pricking pains in the neck; absence of marked symptoms during repose of mind and body; fruitless exhibition of an emetic; laryngo-tracheotomy at the end of the second day; expulsion of the foreign body soon after the operation; ligature of several veins; embarrassment of breathing after the operation; recovery.* (Baron Boyer, Journal Hébdomadaire de Médecine, t. ii. p. 268, 1829.)

A girl, nearly five years of age, inhaled, on the 16th of September, 1828, a glass bead, of an oblong shape, smooth, hollow, and five lines long by three lines in breadth at its widest part.

She complained, soon after the occurrence, of pricking pains in the neck, and when she walked or moved, she experienced violent cough, followed by a peculiar wheezing noise. During repose, the symptoms were comparatively mild, and the breathing did not seem to be embarrassed. Two grains of tartar emetic were given, with no other effect than that of expelling some water from the stomach. The following day the child was pretty comfortable, but during the next night the sleep was difficult and frequently interrupted by fits of coughing. On the succeeding morning laryngo-tracheotomy was performed, the external incision extending from the inferior border of the thyroid cartilage to within half an inch of the sternum. A large vein, which coursed along the middle of the neck, was held aside by an assistant. The sterno-hyoid and thyroid muscles were then separated by cautious touches of the knife. Before the trachea was laid open several veins were tied. The tube being then steadied, several of its rings were divided along with the cricoid cartilage. The moment the incision was made the child ceased to cry and speak. Although the orifice was quite large, the foreign body did not escape, and the Baron made no effort to extract it. The child was, therefore, carried to bed, care being taken to keep the wound open, and protected from the air with a piece of thin linen. Upon raising this, a short time after, the bead was found to have escaped from the trachea.

Everything went on well until about the end of the fourth day, when, the wound being on the point of closing, the child was suddenly seized with suffocative symptoms, which lasted for several hours, and were attended with lividity of the face, protrusion of the eyes, and the most dreadful anxiety. The attacks returned repeatedly during the next four days, when they were relieved by slightly separating the edges of the wound. The air continued to escape at the artificial opening for more than three months and a half after the operation, and it was not until this was completely closed that the little girl recovered the full powers of her voice. The granulations had to be repressed with nitrate of silver, and the cicatrice had an unseemly appearance.

Case 6.— *Water-melon seed; boy, between four and five years of age; shrill, croupy cough, and difficulty of breathing; emetics; laryngo-tracheotomy at the end of several days; operation performed at "two periods;" immediate removal of the foreign body; violent hemorrhage; recovery.* (Samuel A. Cartwright, M. D., New England Journ. Med. and Surgery, vol. xiv. p. 135. 1825.)

Levi Wicks, between four and five years of age, on the 31st of August, 1824, in sipping the water of a melon, drew a seed into his windpipe. Great difficulty of breathing, and a shrill cough, like that of croup, were the prominent symptoms when Dr. Cartwright saw the case, soon after the accident. An emetic of ipecacuanha produced so much relief that the lad was soon able to run about the house, the respiration being free, and his cough having subsided. In the night the difficulty returned, but soon went off; he rested tolerably well afterwards, and went to play in the morning. In the evening his symptoms recurred with increased violence, and he came very near being suffocated. Something could now be plainly heard moving up and down the trachea. Things remained in this condition, now better, and now worse, until the evening of the 2d of September, when laryngotomy was attempted, but not finished, owing to the division of the "laryngeal artery," which bled so profusely before it could be tied that the child was almost exhausted. The wound was dressed. The symptoms continued in their former violence, and on the night of the 3d, the patient was nearly suffocated. The operation was resumed on the 4th; the thyroid and cricoid cartilages were exposed by repeated touches of the scalpel, and then divided from one extremity to the other, along with the two upper rings of the trachea and the isthmus of the thyroid gland, which was supposed to be a muscle, and which bled most profusely, "the blood spouting out furiously to the opposite wall," dashing into the face of the operator and those of his assistants, and rushing into the windpipe. The child was instantly turned upon his face, to prevent suffocation. A pair of curved forceps was now introduced, and the melon-seed forced from the sinus of the larynx up into the mouth. "Almost at the same instant, the lower angle of the wound was pressed out by the forceps, the tenaculum thrust into the gland, amidst the bleeding vessels, and a ligature put around them all together. One small artery yet continued to bleed, which was caught, by turning out the edge of the wound, and secured." As soon as the hemorrhage had sub-

sided the child vomited, and threw up about half a pound of blood, apparently from the lungs. The breathing became at once free and easy, and the cough subsided. The pulse for the first two days was 130. In less than two weeks, the wound had healed up perfectly.

Case 7.—*Kidney-bean; boy, aged nine years and a half; violent cough, dyspnœa, and pain in the neck; laryngo-tracheotomy on the fifth day; ligation of four veins; expulsion of the foreign body two hours after in a fit of sneezing; recovery.* (Baron Boyer, Traité des Maladies Chirurgicales, t. v. p. 502. Paris, 1846.)

On the 20th of January, 1820, a lad, aged nine years and a half, allowed a white kidney-bean to drop accidentally into his windpipe, where it instantly induced violent coughing and other symptoms denotive of the presence of a foreign body in that tube. His mother, who arrived immediately after, made him swallow some bread, thick soup, and other articles, with the effect of producing a temporary calm; but he was soon seized with dyspnœa, and pain in the middle of the neck. Six hours after the accident, a physician ordered an emetic, which acted several times, and he also applied errhines. The night was passed tranquilly until 4 o'clock in the morning, when the cough returned; the respiration became more embarrassed, and was accompanied with a deep râle. The symptoms gradually increased in severity, and on the 25th the Baron performed the operation of laryngo-tracheotomy, dividing the upper rings of the trachea, the cricoid cartilage, and the crico-thyroid membrane. Not less than four veins required to be ligatured. The air entered and issued with a loud noise at the wound, but no foreign body appeared. Not wishing to make any attempts at extraction, Boyer covered the wound lightly with a piece of gauze, and put the child to bed. The respiration became immediately relieved, and two hours after, while he was asleep, snuff was applied to his nose. The instant he awoke he began to cough and sneeze, and presently the foreign body was found in the gauze covering the wound; it was nine lines in length, five in width, and four in thickness, being at least one-third larger than any of the others with which the child had been playing at the moment of the accident. Complete recovery followed.

Case 8.—*Pebble; girl, aged eleven years; violent cough and sense of suffocation; laryngo-tracheotomy at the end of the ninth day; foreign body swallowed, and evacuated next day by the bowels; recovery.* (Dr. H. G. Jameson, Amer. Med. Recorder, vol. vii. p. 36. 1824.)

A girl, aged eleven years, playing with a pebble in her mouth, became suddenly alarmed by a sense of suffocation, followed by a violent cough, and the conviction that the substance had passed into the throat. The symptoms soon moderated, except when she attempted to stoop, when she was seized with cough and suffocative feelings; she experienced much oppression in the chest, and was a good deal disturbed in her sleep. When Dr. Jameson first saw her, about nine days after the accident, the child breathed with tolerable ease, and had no cough, but when requested to cough, she emitted a peculiar "ripping sound;" there was a wheezing noise in the chest, and the countenance had somewhat of a tumid appearance. The finger, applied to the upper part of the throat, perceived, during coughing, a sensation as if something were striking against it. In short, everything—the history of the case, and the present symptoms—indicated that the pebble was still in the air-passages. An operation was, therefore, determined upon. This consisted in dividing three rings of the trachea, the crico-thyroid membrane, and the inferior extremity of the thyroid cartilage. A pair of forceps, formed of silver wire, was now passed down into the tube, but the stone could not be felt. A probe, with a piece of sponge at the end, was next introduced, and after several repetitions of this kind, the child suddenly exclaimed that the foreign body "was gone." She could no longer cough, and the wheezing had ceased. The wound, however, was kept open; the patient rested well during the succeeding night; and the next morning she took a dose of castor-oil, and soon after voided the pebble.

Fig. 52.

For several days she had a cough, and expectorated a good deal of mucous and bloody fluid; she had also some fever, but this never ran high. She was bled once, and took several doses of Epsom salts. Perfect recovery was the consequence.

Case 9.—*Grain of coffee; girl, aged six years; violent suffocative cough, followed by hectic fever; emetics; laryngo-tracheotomy at the end of five weeks; immediate expulsion of three fragments of the foreign body, followed by the ejection of another piece the next morning; recovery.* (Dr. Daniel Drake, Western Journ. Med. and Physical Sciences, vol. xi. p. 341, 1837.)

The patient, a girl, six years old, eating some unburnt coffee, was thrown, while at play, from a low porch, and, as she was in the act of falling, some of it passed into the windpipe. A violent suffocative cough instantly ensued, and lasted without any abatement for half an hour; a kind of intermission then occurred, but was followed by renewed paroxysms of cough, in each of which the patient was nearly strangled. Her parents administered several emetics without effect. At the end of five weeks, Dr. Mount, of the neighborhood of Cincinnati, was called in. The child was emaciated, and, to a considerable extent, hectical. Her cough was hoarse and spasmodic, with now and then some expectoration. The stethoscope discovered that the right lung was nearly silent, while the left was affected with mucous rattle.

An operation was immediately determined upon, and performed by dividing the cricoid cartilage and first ring of the trachea. Almost instantly three fragments of a grain of coffee were expelled by coughing. A probe, and afterwards a pair of forceps were passed down to the bifurcation of the trachea; but nothing was felt. Light dressings were applied, and an anodyne administered. In the course of the succeeding night the girl had several severe fits of coughing. Next day a large fragment of coffee, amounting to nearly half a grain, was found upon the dressings. The breathing became at once easier, with a return of the vesicular murmur in the right lung, but the mucous rattle in the left still continued. The cough and fever rapidly abated, and in a week the child was running about the house.

Case 10.—*Button-mould; man, aged twenty-four; frequent and violent fits of coughing; bloated countenance; distress in the larynx; laryngo-tracheotomy at the end of six weeks; lodgement of the substance in the left ventricle of the larynx; extraction with the forceps; recovery.* (P. J. Pelletan, Clinique Chirurgicale, t. i. p. 8. Paris, 1810.)

In 1805, a man, aged twenty-four, applied at the Hôtel Dieu, of Paris, on account of a suffocative cough with which he had been

tormented for six weeks. The face was bloated, and the eyes, habitually humid, had a peculiarly brilliant expression. The fits of coughing were frequent and violent, and the patient labored under a constant rhonchus. It seems that, six weeks before, he had inhaled a button-mould, which he had thoughtlessly put in his mouth while he was engaged in urinating. The accident was immediately followed by violent cough, and he had experienced no comfort since. He also stated that the greatest local impediment existed in the region of the larynx.

Tracheotomy was performed, but the foreign body not appearing, Pelletan introduced his little finger into the wound, towards the larynx, and distinctly felt the button-mould, with the opening in its centre (Fig. 53). He vainly endeavored to seize it with a pair of forceps, nor did he succeed until after he had divided the ring of the cricoid cartilage, when it immediately presented itself, and was at once extracted from the left ventricle of the larynx, where it had been impacted. In the evening after the operation, there was some fever, for which the patient was bled, after which he gradually recovered.

Fig. 53.

SECTION II.

CASES OF LARYNGO-TRACHEOTOMY, FOLLOWED BY THE DEATH OF THE PATIENT.

The number of cases embraced in this category are three; which are all that I have been able to find in our periodical and systematized literature.

One of the patients was a female, and the other two were males. The ages were four, seven, and thirty-five years. The foreign bodies were, a damson-stone, a dog's tooth, and an English sixpence. The symptoms and previous treatment do not require special mention, as they are sufficiently noted in the table. In one of the cases only was the foreign body removed; in the other two it remained in the parts, being discovered in the left bronchial tube in one, and in the right bronchial tube in the other.

In a case of laryngo-tracheotomy, communicated to me by the late Dr. William A. McDowell, of Evansville, Indiana, death ap-

pears to have taken place from suffocation on the following day. The patient was a girl seven years of age, and the foreign body, a bean, was distinctly perceived moving up and down the trachea during respiration. What was singular was, that great difficulty of breathing immediately succeeded the operation, and continued unabated until the child expired. The substance was found, on dissection, in the right bronchial tube.

TABLE OF CASES OF LARYNGO-TRACHEOTOMY, FOLLOWED BY DEATH.

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	PREVIOUS TREATMENT.	TIME OF OPERATION.	ACCIDENTS.	TIME AND CAUSE OF DEATH.	MODE OF EXPULSION.	OPERATOR.	AUTHORITY.
1	Damson-stone	Male	4 years	Great dyspnœa; stridulous breathing; use of canula, and increase of dyspnœa when the instrument was withdrawn.	Probang passed into stomach	Day after; first tracheotomy, and, in a few hours, laryngotomy.		Death in 36 hrs., from exhaustion	Retained in left bronchia	Mr. James Spence	Lond. and Edin. Monthly Journ., p. 24, Jan. 1842.
2	Dog's tooth	Female	7 years	Pain and rattling in the larynx, and difficulty of swallowing, foreign body in the larynx.		Tracheotomy at ten hours and a half, and afterwards laryngotomy.	Hemorrhage and emphysema of the neck	Death on 15th day, from bronchial obstruction	With forceps.	Dr. T. G. Geoghegan	Dub. Med. Press, Jan. 24, 1849.
3	Six-pence	Male	35 years	Very violent at first, then mild; unable to stoop or lie low without exciting cough; constriction and soreness in chest.	Venesection	Laryngotomy at the end of 5th week, and tracheotomy nearly 3 months after.	Slight venous hemorrhage	Death from apoplexy, immediately after last operation	Retained in right bronchia	Mr. Key	London Lancet, ii. 661, 1828–29.

NARRATIVE OF CASES OF LARYNGO-TRACHEOTOMY, FOLLOWED BY DEATH.

CASE 1.—*Damson-stone; boy, aged four years; laryngo-tracheotomy the day after the accident; fruitless efforts to extract the foreign body; use of silver canula; death about thirty-six hours after the operation; foreign substance in one of the branches of the left bronchial tube.* (James Spence, Esq., London and Edinburgh Monthly Journal, January, 1842, p. 24.)

The patient in this case had inhaled a small damson-stone the evening before he was seen by Mr. Spence. After the immediate symptoms had passed off, he appeared quite well, and slept as usual during the night. He took his breakfast the following morning, but shortly afterwards, while playing about the room, he suddenly cried out that he felt the stone in his throat, and almost instantly fell down in a state of suffocation. The face was swollen and livid, the eyes prominent, the veins of the neck turgid, the nostrils dilated, and the respiration prolonged, and accompanied with a peculiar stridulous noise. A probang was introduced into the stomach, but it met with no obstacle. As the danger was most urgent, the trachea was opened, and search made for the foreign body, both in the larynx and the other parts of the windpipe. Nothing, however, was found, although the suffering was at once greatly relieved, and a canula was therefore inserted into the passage, to facilitate breathing. A few hours after the operation, the aperture was enlarged by dividing the cricoid cartilage, when further but equally unsuccessful attempts were made to remove the extraneous substance. As long as the canula was employed, the respiration was sufficiently free, but when it was withdrawn, it became at once embarrassed, and thus rendered its replacement necessary. Gradually, however, the symptoms increased in violence, and in about thirty-six hours after the operation the child died exhausted. On dissection, the damson-stone, with its larger end projecting upwards, was found impacted in one of the ramifications of the left bronchial tube. The lungs appeared to have been but little affected by inflammation.

Mr. Spence, in commenting on this case, observes that the urgent symptoms were almost instantly relieved by opening the trachea,

although the foreign body was not expelled; and that, while the child breathed freely through the canula, both sides of the chest seemed to be equally expanded, and at the same moment; but on the other hand, whenever the tube was removed, and the opening in the windpipe closed, difficult respiration returned. These circumstances appear to have induced him at first to believe that the extraneous substance might have been originally lodged in the larynx, and his opinion at one time was that it might have been pushed from thence into the œsophagus.

Case 2.—*Dog's tooth; girl, seven years of age; substance in the larynx; tracheotomy ten hours and a half after the accident; subsequent division of the cricoid cartilage; immediate extraction of the foreign body with the forceps; emphysema of the neck; death, on the night of the fifteenth day after the operation, from a mass of mucus in the bronchial tubes.* (Dr. T. G. Geoghegan, Dublin Medical Press, January 24, 1849; Braithwaite's Retrospect, No. xix. p. 154. New York, 1849.)

A little girl, aged seven years, having inhaled a dog's tooth, was immediately seized with coughing and dyspnœa, attended with pain and rattling in the upper part of the larynx, and difficulty of swallowing. Ten hours and a half after the accident, when the trachea was opened by Dr. Geoghegan, she was in imminent danger of suffocation; the face and lips were livid, the eyes staring and prominent, and the efforts at respiration violent. The incision occupied the usual situation, and was from one-half to three-fourths of an inch in length. As there was a considerable flow of venous blood, which rapidly entered the trachea, it was thought best to introduce a canula, and to plug the wound around it with sponge, deferring the search for the tooth until the mouths of the vessels should be sealed by plastic effusion. The bleeding at once ceased, and the breathing became tranquil. The collapse, consequent upon the operation, disappeared in a few hours, under the influence of stimulants. In the middle of the night, a sharp clicking sound was heard at the wound whenever the child swallowed, and on pressing the canula gently backwards, it was observed distinctly to strike against some hard body. Supposing that this must be the extraneous substance, the tube was removed, with a view of searching for it, but, as the bleeding and dyspnœa instantly recurred, Dr. Geoghegan was immediately compelled to replace it. A short time previous to this attempt, the uneasiness in the upper part of the larynx had

disappeared, and the canula could no longer be heard to strike against the hard body; two circumstances clearly showing that the latter had changed its original position.

The night was spent in tolerable comfort; but in the morning, the bottom of the neck was emphysematous, and the respiratory murmur was distinctly audible in both lungs, but less in the left than in the right. Thirty-six hours after the operation, as all danger of hemorrhage was past, the canula and sponge were removed, and a search instituted for the tooth by means of a probe, carried, first, into the bronchial tubes, and then up into the larynx, in the superior part of which it was distinctly perceptible, though its precise situation could not be determined. An attempt was now made, without success, however, to extract it with the forceps. A careful enlargement of the wound upwards having failed to facilitate this attempt, Dr. Geoghegan divided the cricoid cartilage, and also a small portion of the crico-thyroid membrane, when, with a pair of common dressing forceps, he readily removed the foreign body. This proved to be the molar tooth of a dog, three-eighths of an inch in breadth, and three-fourths of an inch in length, the prominences of the crown and point of the fang being sharp.

The child appeared to be doing well up to the night of the fifteenth day from the operation, when she was suddenly seized with difficulty of breathing, and expired. Death seemed to have been caused by a mass of thick, viscid mucus, which occupied the bifurcation of the trachea and blocked up the tubes, thus preventing respiration, which, only a short time before, was as tranquil as usual.

Case 3.—*An English sixpence; man, aged thirty-five; laryngotomy at the end of the fifth week, and tracheotomy nearly three months afterwards; death immediately after the latter operation.* (Mr. Key, London Lancet for 1828–9, vol. ii. p. 661.)

John Hughes, aged thirty-five, was standing, on the 6th of April, with his child in his arms, having between his teeth a sixpence, for which he was about to give change, and which, while he was in the act of speaking, slipped into his throat. He immediately fell back, struggling for breath, and unconsciously dropped the child. After a few moments, during which he made the most violent efforts to respire, the breathing became easy, and he complained merely of a disposition to cough, with a slight sense of constriction and sore-

ness across the chest. These symptoms continuing for two days, he was bled with relief; but he was unable to stoop, or lie low with his head, without exciting cough; and at such times he always experienced a sensation in the chest, as though, to use his own expression, "something were hanging there." In the month of May, about five weeks after the accident, laryngotomy was performed, but without finding the foreign body. No inconvenience followed, and the wound rapidly cicatrized. He was soon afterwards attacked with gout in his feet, by which, as well as by the previous treatment for the inflammatory symptoms, his strength was a good deal reduced.

Mr. Key was called to the case during the summer; and having satisfied himself, by percussion and auscultation, as well as by experiments upon the dead subject,[1] that the sixpence must be lodged in the right bronchial tube, he opened the trachea on the 6th of August, four months after the accident, and nearly three after the performance of laryngotomy. A free incision was made through the integuments immediately above the sternum. The dissection, which was necessarily tedious, was performed with the utmost care and precaution; the thyroid gland extended much lower down than usual, and was, therefore, divided and turned back. A very small opening was made into the trachea, when the patient, who had hitherto not even uttered a groan, gave a cough and started forward; at that moment a gush of venous blood took place, and the man fell on the floor. The hemorhage was at once restrained by pressure, and not more than two ounces of blood were lost during the whole operation. The patient at this period appeared to be in a state of syncope; the countenance was pale, and the pulse could not be felt at the wrist. To this state quickly succeeded one closely resembling apoplexy. The pulse at first beat slowly, laboringly, and irregularly; the eyes were fixed, and there were some convulsive movements of the legs; the pulse then became quick and small, the countenance assumed a purplish hue, the veins of the forehead were distended, the skin was bathed in a cold per-

[1] Mr. Key found that the left bronchial tube of an adult subject would just admit a sixpence to enter, whereas the right, from its more horizontal direction, and larger dimensions, would permit it to descend to the distance of an inch. Passing a sixpence as far as possible into the right tube of a dead man, he repeatedly extracted it from thence with great facility with a pair of long, slender forceps, the handles of which were bent forwards like those of the common curved scissors.

spiration, and the breathing became stertorous. While breathing in this manner, the left side of the chest alone seemed to be inflated, the right being almost motionless. Consciousness never returned. Several slight efforts to cough took place, and, after continuing in the state above described for about an hour, he expired.

On the following day, Mr. Key enlarged the opening in the trachea, and passed a pair of forceps down into the right bronchial tube, from which he removed, without much difficulty, after a few trials, the sixpence. It was found to be perfectly blackened, and the inscription much defaced, though still legible. There was no blood in the trachea. The bronchial glands were enlarged, and the upper third of both lungs appeared inflamed and hepatized. The mucous membrane of the right bronchial tube, where the foreign body had lain, was thickened and ulcerated. The brain exhibited nothing peculiar, being only a little more vascular than usual.

In reflecting upon this case, the question arises, how did Mr. Key's operation happen to end so disastrously? As there was no blood found in the trachea, we cannot suppose that the man died from suffocation. What, then, induced the fatal result? The only legitimate conclusion, taking into account all the facts in the case, is, that death was occasioned by the introduction of air into the thyroid veins. All the symptoms, from the beginning to the end, clearly, I think, prove this fact; if what is nothing but a conjecture can be called a fact.

CHAPTER XIII.

REPETITION OF BRONCHOTOMY.

Circumstances may arise which may render it necessary to repeat the operation of bronchotomy, or to perform it a second and even a third time, upon the same individual. Thus, the windpipe may have been opened soon after the occurrence of the accident, but the foreign substance may have failed to be expelled; all the bad symptoms disappear, and the patient flatters himself that he is permanently relieved. Gradually, however, as the wound cicatrizes, the dyspnœa and cough return, perhaps even with increased violence, and thus necessitate another operation. Indeed, the surgeon, under such circumstances, has no choice; a resort to the knife is just as indispensable as in the first instance, and he who hesitates does so at the risk of his patient's life.

The probability is that the number of cases in which the operation has been repeated upon the same patient is very small. The following are the only ones that have fallen under my notice. The first occurred in the practice of Mr. William Fergusson,[1] Professor of Surgery in King's College, London, in a girl, seven years of age, who had inhaled a plum-stone, for the removal of which tracheotomy was performed unsuccessfully soon after the accident. Being repeated three months afterwards, the foreign body was extracted, and the child made a good recovery. The second case has been reported by Mr. Edwin Humby,[2] of England, and is remarkable on several accounts. The patient was a man, aged fifty-three years, who was affected with disease of the larynx, in the course of which he inhaled a piece of his cricoid cartilage. Tracheotomy was performed three times, and as the tube was ossified, its rings had to be divided with the bone-nippers; the foreign sub-

[1] Practical Surgery, p. 480, 4th ed. Phila., 1853.

[2] London Lancet, for 1850, vol. i. p. 78.

stance was coughed up soon after the last operation, but death occurred six days after this event. The third and last case, communicated to me by Dr. John L. Atlee, of Lancaster, Pennsylvania, is one of the most remarkable on record, and deserves an attentive perusal.

In a case under the observation of Mr. Porter,[1] of Dublin, the wound, made in the operation, was obliged to be reopened, to its original size, at the end of the twenty-second day, on account of the increased difficulty of breathing. This step afforded immediate relief. Two months afterwards the orifice being again nearly healed, the child, in a desperate fit of coughing, expelled the foreign substance, a small pebble, through the rima of the glottis.

Case 1.—*Plum-stone; girl, aged seven years; tracheotomy soon after the accident, without success; repetition of the operation three months afterwards, followed by the extraction of the foreign body; recovery.* (Mr. William Fergusson, Practical Surgery, p. 480, 4th edition, Phila. 1853.)

A girl, aged seven years, in reaching her hand high above the head, inadvertently let a plum-stone, which she had in her mouth, slip backwards, when it entered the larynx, and immediately produced most severe coughing and impediment to respiration. Tracheotomy was performed soon after the accident, but, owing to the difficulty of keeping the patient quiet, the foreign body could not be seized, and the case was accordingly abandoned. The wound closed, and the suffering continued as before; at times, the patient had some rest, but often, and suddenly, she would drop on the floor in a state of asphyxia, from which she would recover after a violent effort at inspiration. Three months afterwards, she came under the charge of Mr. Fergusson, who performed another operation, and succeeded in extracting the plum-stone. After making the wound in the trachea, he introduced a pair of slender forceps, but for a time he was unsuccessful in his object: the substance seemed to move upwards and downwards alongside of the blades, and at last, under this impression, and at a time when he imagined that it was at the lower part of the tube, he opened the blades, and held them so until the next expiration, when he closed them suddenly, and thus caught the kernel, which was then extracted with a slight pull.

[1] Todd's Cyclopædia of Anatomy and Physiology, vol. iii. p. 125. London, 1847.

Immediately all annoyance ceased; the wound closed almost entirely by the first intention; and in eleven days, when every danger was apparently over, the child was permitted to go into the country. Here, however, she took cold, and in three weeks afterwards she died of difficulty of breathing, occasioned, as was supposed, by swelling of the mucous membrane of the larynx.

It is worthy of remark that Mr. Fergusson satisfied himself, before he performed the operation, that the plum-stone moved up and down the trachea; this was most distinctly noticed when the larynx was embraced by the thumb and forefinger, for then, if the patient was desired to cough, the impulse of the foreign body was felt as it struck the narrow part above. Its presence could be more clearly ascertained in this manner than by auscultation.

Case 2.—*Piece of ossified cricoid cartilage; man, aged fifty-three; disease of the larynx; tracheotomy performed three times; ossification of the trachea, and division of its rings by means of the bone-nippers; expulsion of the ossified cartilage by coughing; death six days after the last operation; post-mortem examination.* (Mr. Edwin Humby, London Lancet for 1850, vol. i. p. 78.)

A man, fifty-three years of age, having contracted syphilis two years before, became affected with so much difficulty of breathing that he was obliged, in July, 1845, to submit to the operation of tracheotomy. He wore a silver tube for one month, when, the respiration being greatly improved, it was dispensed with. Three weeks afterwards, however, the dyspnœa returned, and he was obliged to reintroduce it. In July, 1846, having worn the instrument ten months, and finding the difficulty of breathing increasing, it was determined to enlarge the opening. In attempting to do this the rings of the trachea were found to be so completely ossified that it was impossible to divide them, without the aid of the bone-nippers. A large piece of the windpipe was then cut out, and a bigger tube introduced, to the great relief of the patient. He went on very comfortably for three months, with the exception of a single attack of bronchitis. In October, he became worse. He suffered from constant cough, with fetid muco-purulent expectoration, the breathing was hurried, the laryngeal voice was entirely gone, and the sleep was greatly interrupted. The physical signs were dulness and deficient breath-sound, with tubular expiration in the left scapular region, and weak vesicular murmur at the infe-

rior part of this side. In the lower part of the right side there was muco-crepitation without dulness.

The cough becoming daily worse, another piece of the ossified trachea was cut out with the bone forceps by Mr. Liston, on the 14th of November. After the operation, the patient was almost suffocated from the entrance of blood into the trachea, and, during the struggle to recover his breath, he coughed up a large piece of necrosed substance, which was found to be the posterior broad part of his own cricoid-cartilage. Notwithstanding this fortunate riddance, the symptoms became more and more severe, and the man gradually sank, six days after the operation.

The right pleural cavity contained about three pints of turbid serum, mixed with flakes of lymph; the corresponding lung was sound, except that it was slightly congested. The upper lobe of the left lung was adherent, hepatized, softened, and infiltrated with bloody matter. In the left bronchial tube was a small piece of necrosed ossified cartilage. The passage through the larynx upwards, from the opening in the trachea, was barely large enough to admit a fine probe; the posterior broad portion of the cricoid cartilage was absent; the rings of the trachea were ossified nearly down to the bifurcation of the canal; and the parts immediately round the artificial aperture were greatly contracted.

Case 3.—*Hickory-nut shell; girl, aged nine years; severe and urgent symptoms, with croupy cough; useless exhibition of an emetic; laryngo-tracheotomy a few hours after the accident; venous hemorrhage; frequent but unsuccessful attempts at extraction; emaciation and hectic fever; repetition of the operation nearly seven months after the first operation; death on the following day; situation of the foreign body at the bifurcation of the trachea; pneumonia and pleurisy.* (Communicated to the author by John L. Atlee, M. D., of Lancaster, Pennsylvania.)

Elizabeth Wertz, aged nine years, while playing with her schoolmates, on the 12th of November, 1844, and running with a hickory-nut shell in her mouth, stumbled and fell, at the same moment involuntarily drawing the shell into the windpipe. An emetic was given soon after the accident, followed by an increase of the difficulty of respiration. Dr. Atlee saw her about four hours after, and found her lying on her side, gasping for breath, as if in the last stage of croup. At every inspiration there was a violent

contraction of the muscles of the chest and distortion of the countenance, indicating almost complete closure of the windpipe. The face and lips were livid, and there was occasionally a croupy cough. Finding that there was no time to be lost, and believing that the foreign body was in the larynx, an incision was made through the cricoid cartilage and the two upper rings of the trachea, but to the surprise of the operator no relief followed, and but little or no air escaped at the orifice. Introducing a probe, the shell was found to be fixed across the trachea, about three-quarters of an inch below the wound, the edges of which were then held apart with blunt-hooks, while an attempt was made to pass a pair of curved pocket-case forceps. Owing to the prominence of the chest, the projection of the chin, and the extreme shortness of the neck, some difficulty was experienced in doing this; but the instrument was at length brought in contact with the foreign substance, although the blades could not be expanded over it, as every effort of the kind brought on violent gasping and a sense of suffocation, compelling the instant withdrawal of the forceps. After repeated attempts of this kind the operation was abandoned.

Bending the end of a silver probe into a hook, and giving the instrument a proper curve, Dr. Atlee carried it below the shell, and after several times withdrawing and reintroducing it, he finally succeeded in dislodging it. The frightful symptoms which attended these efforts instantaneously subsided, and the child became perfectly comfortable, breathing as softly and gently as if in health, and almost immediately falling into a profound sleep. This calm, however, was only of short duration, for having slept about fifteen minutes she was waked, and requested to cough, when, in an instant, there was a frightful renewal of the alarming symptoms. The wound being hastily opened, the shell was found pretty much in the same situation as before, but producing, if possible, greater obstruction. Instead of passing out when first moved, the violent effort at inspiration had forced it down into the right bronchial tube, and thus temporarily relieved the breathing.

Determined to enlarge the wound, Dr. Atlee divided another ring of the trachea, and in the act of doing this he laid open one of the thyroid veins. A rapid and profuse hemorrhage was the consequence, which was arrested only by the ligature. A careful examination of the neck led to the conviction that the incision could not be extended any further in that direction. The attempts

at extraction with the forceps were now repeated, not once, but many times, but without success, owing to the struggles of the child, the incessant cough, and the extreme difficulty of breathing. Introducing the probe again, the shell was once more dislodged, with instantaneous relief; the respiration was perfectly calm and easy, and she could cough without the slightest recurrence of suffering. After waiting an hour and a half, during which everything went on most satisfactorily, the wound was closed with adhesive strips, extending half round the neck, and effecting close approximation.

Upon applying the ear to the chest, the air was found to enter the left lung without any difficulty, but on the right side, although the vesicular murmur was distinct, there was not the puerile sound which characterizes infantile respiration. The child passed a tolerably good night, but the next day she was feverish and had a troublesome cough, for the relief of which a dose of oil was administered. The respiration was as on the previous evening, with more mucous râle, but no severe paroxysms of dyspnœa. On the 16th of December, the wound was entirely closed; but there was a train of symptoms clearly indicating the lodgement of the shell at the root of the right bronchial tube, and the existence of severe inflammation in the corresponding lung. A proposition to reopen the windpipe was rejected by the parents.

Dr. Atlee visited his patient again on the 3d of June, 1845, finding her much emaciated, with a feeble, rapid pulse, and other symptoms of hectic; the breathing was frequent, the cough was exceedingly troublesome, the right side of the chest was very dull on percussion, and there was almost complete absence of respiratory sound. Another operation was now performed, the windpipe being opened as before; but such was the excessive irritability of the mucous membrane that every touch of the probe excited violent cough and distress. "The small quantity of air passing through the bronchial tube from the right lung, forbade the hope that the shell would be forced up into its former position; and I was not then aware of the fact," says Dr. Atlee, "which my next case so fully demonstrated, that if I had persevered in maintaining the instrument within the trachea and bronchial tube, until the first severe paroxysm of cough had subsided, there would subsequently have been such a toleration of its presence as would have enabled me to move it about for the purpose of extracting the foreign

body." The wound was again closed, and the child died the next day.

The right lung was very hard and firm, and closely attached, at its superior and middle lobes, to the costal pleura, by bands of false membrane. The mucous coat of the trachea was highly inflamed, and the shell was found lying loosely just at the bifurcation of the tube, its situation being indicated by a ring, about an inch broad, and of a deep red color. Numerous red spots existed all around. The shell was of an irregularly square figure, with sharp angles, and about half an inch in length at the longest part, by about three-eighths of an inch in width. The left lung and pleura were perfectly sound.

CHAPTER XIV.

CASES OF BRONCHOTOMY IN WHICH NO FOREIGN BODY WAS FOUND, ALTHOUGH THE SYMPTOMS WERE STRONGLY DENOTIVE OF ITS PRESENCE.

The probability is that these cases are more frequent than the records of the profession would lead us to suppose. Surgeons are notoriously averse to publishing their unsuccessful operations; and it is, therefore, reasonable to conclude—especially when we take into consideration the difficulty of the diagnosis, in many of these cases—that numerous instances have occurred, of which no account has ever met the public eye.

The following cases, which are all that I have been able to find, are of great practical interest. It is proper to observe that the operators concerned in them were men of no ordinary skill and judgment.

A child, aged seventeen months, was suddenly seized with stridulous breathing, and symptoms of suffocation at the breakfast-table, while the mother was feeding it with boiled egg. After some efforts, during which the morsel was supposed to have been dislodged, the respiration became natural; in the afternoon, however, in tossing the child about, it suddenly strangled again, and breathed with a croupy sound. Dr. A. L. Pierson,[1] of Salem, Massachusetts, being called in on the sixth day after the accident, found it laboring under great difficulty of respiration, and therefore determined to open the trachea. No foreign substance could anywhere be discovered, although various expedients were employed for the purpose; but the operation at once relieved the urgent symptoms, and the child passed a tolerable night. A tube was now introduced into the passage, the removal of which was invariably followed by stridulous breathing. The day after the operation the body was

[1] Boston Medical and Surgical Journal, vol. xxxix. p. 43, 1849.

inverted, and a small probang used for clearing the larynx, but nothing was discovered. On the fourth day, the tube being removed, the child breathed without any stridulous noise, and it soon recovered without any untoward symptom.

The questions of interest, as Dr. Pierson justly remarks, in this case, are two; first, was there any foreign body? and, secondly, if so, what became of it? In answer to the first, it may be stated, as highly probable, that a portion of the egg which the child was engaged in eating at the time it was seized with the alarming symptoms, passed into the windpipe; and, secondly, that the substance was, in all likelihood, dislodged in some of the efforts made by Dr. Pierson to remove it, and swallowed by the child. As it was of a digestible nature, there was no chance, of course, of seeing it in the alvine evacuations.

The following case, observed by Mr. Read, of Dublin, and detailed at length by Dr. Stokes, in his *Treatise on the Diseases of the Chest*, possesses much interest, both in a pathological and practical point of view. I shall give it, as nearly as possible, in the language of the distinguished narrator.

A gentleman, aged twenty, who had previously enjoyed excellent health, while conversing in the act of eating a piece of cheese after a hearty dinner, suddenly fell from his chair in a state of insensibility. On the supposition that a foreign body had become fixed in the œsophagus, a probang was speedily passed, and in about ten minutes he partially recovered. Soon after, however, the attack recurred with great violence; the face was strongly congested, and the breathing was spasmodic and stertorous. Blood was then freely taken, but no improvement followed. Stimulating injections and a second bleeding were employed, but still without relief. The situation of the patient became every moment more critical; he tossed himself on the bed, and threw his arms about so as to extend the chest as much as possible; a loud rattling was heard in the throat; all the muscles of inspiration were in the most violent action; and the surface of the body became pale and cold. The chest sounded everywhere clear, but the vesicular murmur could scarcely be perceived in any portion of the lungs, the feebleness being equal and universal, notwithstanding that the patient made the most violent efforts at inspiration. A loud sono-mucous rattle, every moment increasing, was heard in the trachea, while the

slight dilatation of the chest, compared with the respiratory efforts, clearly pointed out some obstruction in the windpipe.

Under the supposition that the case was one of obstruction of the air-passages, produced by a morsel of food, and not one of mere spasm of the glottis, caused by cerebral irritation; and inasmuch, moreover, as the treatment calculated to relieve the brain, had signally failed, tracheotomy was performed. A crucial incision having been made through the tube, and the angular portions removed, a mass of pultaceous matter was forcibly ejected through the opening, with complete and instantaneous relief of the symptoms. Respiration became easy, the lungs expanded fully and audibly, the patient breathed through the glottis, and recovery followed without an untoward occurrence.

In about four weeks, however, the man was seized with symptoms of cerebral irritation, and had a fit resembling epilepsy. These attacks recurred several times during the next three months, becoming, however, gradually more mild, and finally wholly disappearing. The treatment consisted of small bleedings, cold to the head, and the use of turpentine.

Dr. Stokes, in commenting upon the uncertain nature of this case, adduces the following reasons for concluding that it was originally one of mechanical obstruction of the windpipe: 1. The attack came on while the man was eating, and at the same time conversing, circumstances likely to cause the entrance of a foreign body into the air-passages. 2. Although in certain cases of disease, in children and in adults of a high nervous temperament, spasm of the glottis is symptomatic of cerebral disorder, yet in a young and robust man such a phenomenon is exceedingly rare. 3. Dr. Stokes lays great stress upon the presence of copious secretion from the mucous membrane, asserting that it is a most important symptom of a foreign body in the trachea, but that it is not seen in nervous affections of that tube. 4. The complete and instantaneous relief which followed the operation, and the expulsion of the soft pultaceous matter from the trachea, and the fact that the patient breathed easily through the glottis from that moment on. 5. It must be recollected, how perfectly the physical signs and the history of the case coincide with the phenomena which a foreign substance would produce. From all these circumstances, Dr. Stokes considers the case as a decided example of a foreign body in the air-passages. Mr. Read, on the other hand, inclines to

the opinion that the original attack was really cerebral, and that the extraneous matter entered the windpipe during the convulsion. The latter view of the case appears to me, after an attentive study of all the circumstances connected with it, to be, on the whole, the more probable; but, however this may be, there can be but one opinion respecting the propriety of the operation, which, unquestionably saved the man's life, and which was, therefore, most opportune.

A child, aged thirteen months, while at dinner with its parents, caught hold of some herring, which it forced into its mouth. It was immediately seized with a violent fit of coughing, and threw out what it had attempted to swallow. Hoarseness soon came on, the cough continued, the child passed a sleepless night, and next morning, the breathing was stridulous. Four days afterwards, it was seen by Dr. R. T. Evanson,[1] who found it in the following condition: The countenance was expressive of great uneasiness, the face was pale and swollen, the skin hot, the pulse rapid, and the expiration short, but not impeded, nor accompanied by any peculiar sound. Inspiration, on the contrary, was long, forced, difficult, rough, and rather stridulous. The voice was hoarse, the throat was inflamed, and there was bronchitis on the right side. The cry was quite clear when the child screamed aloud, and the cough, instead of occurring in sudden and violent paroxysms, as it usually does when there is a foreign body in the windpipe, was of a harassing, teasing character, though, occasionally, the fits were severe enough.

As the nature of the case was obscure, and the child was in no immediate danger, the operation was not performed until about the end of the fifth day, by which time all the symptoms had become greatly aggravated, the strength being much exhausted, the surface cold and livid, and the eyes glassy. No cough was heard, but much uneasiness was apparent. The bone was carefully searched for, but could not be detected. On the morning after the operation, some amendment was manifest, though the respiration was still laborious, stridulous, and wheezing, being seventy in a minute, and accompanied by an occasional fit of coughing, excited, apparently, by the obstruction of the artificial opening by tenacious mucus.

On the fourth night after the operation, the mother of the child,

[1] Dublin Journal Med. and Chemical Science, vol. v. p. 19. 1834.

removed from the wound, as she informed Dr. Evanson, what appeared to be a piece of fish bone. She stated that the bone was soft, of a greenish color, and very brittle, with a sharp hook at one of its extremities. A part of this substance Dr. Evanson saw, and he feels satisfied, both from this fact and from the whole history of the case, that there must have been a foreign body in the windpipe. It was only by accident that the woman gave this information, being apprehensive that, if she revealed the fact, the medical attendants might wish to perform another operation. The child gradually improved, and at length completely recovered.

In the following case, the operator was the late lamented Dr. J. Kearny Rodgers, of New York. For the particulars of it I am indebted to the kindness of my friend, Professor Van Buren, at whose request it was drawn up for me by Dr. C. R. Agnew.

Caroline Hoogleman, a German, aged thirty-two years, was admitted into the New York Hospital on the 18th of January, 1848, under the care of Dr. J. K. Rodgers. About two weeks previously, while holding some pins in her mouth, she was seized with a fit of coughing, in which one of them slipped into the larynx, where it has remained ever since. During breathing she thought she could feel it move slightly about. Its presence was attended with soreness of the throat and difficulty of swallowing, the latter of which, however, came on only two days ago. The pain was constantly referred to one spot. A week since she began to have huskiness of the voice, although previously it had been clear.

The day after her admission, a probang was passed down the œsophagus, without, however, affording any relief, or encountering any foreign body. Exploration with the finger and with curved forceps eventuated in no better success. Laryngotomy was then performed at the crico-thyroid space, the patient having been previously placed under the influence of chloroform. This agent caused a good deal of congestion of the head and neck, leading to considerable hemorrhage, and the necessity of tying several vessels. The opening was subsequently enlarged to a sufficient extent to admit the introduction of the finger; but no foreign substance could be detected, and all further interference was therefore abandoned; cold-water dressing was applied until the oozing had ceased, when the edges of the wound were approximated by four sutures and adhesive strips. The patient passed a comfortable night, and next morning left the hospital for her residence in the country. Some time

after her physician informed Dr. Rodgers that the woman had suffered severely, for a number of days, from the effects of chloroform, that the wound did well and finally healed, that the voice had never regained its natural tone, that she was very liable to attacks of laryngitis and bronchitis, and that, in short, her general health was almost completely revived.

In a case operated upon by Dr. Allen, of Rockville, Indiana, and for the particulars of which I am indebted to Dr. James D. Maxwell, of Bloomington, in that State, no foreign body was found. For several days there was no alleviation of the symptoms, when suddenly, after a severe, convulsive cough, immediate relief ensued. It is very probable that, in this case, the body, supposed to have been a piece of the hard part of a water-melon, was expelled through the glottis, and swallowed.

CHAPTER XV.

CASES OF DEATH WITHOUT OPERATION, AND WITHOUT EXPULSION OF THE FOREIGN BODY.

THE cases arranged under this division of the subject are designed to illustrate, not so much the symptomatology as the pathological effects of extraneous bodies in the air-passages. They amount to twenty-one in number, and the period which intervened between the occurrence of the accident and the fatal termination varied from a few hours to thirteen years. The *post-mortem* appearances are noted in only seventeen of the cases.

Ten of the patients were males, and eight females, the sex in three not being mentioned. The ages varied from six months to seventy-three years. The foreign bodies were, beans in four of the cases, teeth in two, coins in two, bone in three, pebbles in two, and in the remainder, respectively, a cockle-bur, prune-stone, cherry-stone, brass nail, grain of corn, a leech, a piece of ginger, and an apricot-kernel. In nine of the cases, the extraneous substance was situated in the right bronchia, in four in the larynx—once in the right ventricle, and once in the left, and in the other instances, in the cavity of the organ—in three in the trachea, in one partly in the larynx and partly in the trachea, in one in the left bronchia, in one in the third branch of the right bronchia, in one in the lung, and in one in the right thoracic cavity. The period at which death happened varied from a few hours to a number of years. In one, it occurred "soon" after the accident; in one, the following night; in one, in forty-one hours; and in one, at sixty hours; in five, it happened on the ninth, eleventh, nineteenth, thirty-second, and thirty-third days; in five, in six weeks, seven weeks, eight weeks, eighty-three days, and five months; in seven, in one year, nearly thirteen months and a half, two years, four years and a half, five years and a half, ten years, and thirteen years. The cause of death

was as follows; in twelve, exhaustion; in two, suffocation; in three, a fit of coughing; and in one, acute pleurisy. In three, the cause is not stated.

The morbid appearances were such, generally, as might be expected to result from pulmonary irritation. In cases of recent standing, they consisted either in simple engorgement, or in inflammation of the lungs, bronchial tubes, trachea, or larynx, according to the situation of the extraneous substance. In the more protracted cases, the most common morbid alterations were, hepatization, purulent infiltration, or abscess, with pleuritic adhesions and effusions of serum into the thoracic cavity. In several of the cases the thoracic cavity was filled with pus, or pus and serum.

Abscesses, of a well-defined character, existed in four of the cases; and in another, that of Lescure, the right lung is said to have been nearly destroyed by suppuration. In Dr. Gilroy's case, the depôt contained twenty ounces of red, fetid pus; it was situated in the centre of the organ, and communicated with the corresponding bronchial tube, in which the foreign body, a chicken-bone, was found after death. The patient, a female, aged forty years, had an intolerably offensive breath, and died hectic at the end of eighty-three days. In Dr. Brigham's case, which terminated fatally a little upwards of twelve months after the accident, a similar state of things existed, only that there were several abscesses opening into the bronchial tube. The foreign substance was a brass nail, and the patient, a girl, aged five years, died from hectic irritation. In the case narrated by Dr. Struthers, the substance, a piece of bone, was contained in the right bronchial tube, and the corresponding lung was the seat of numerous little cavities, along with two pretty large abscesses. It ended fatally at the expiration of four years and a half, the man having suffered from frequent and copious attacks of hæmoptysis. In the case of Dougherty, which I saw with Dr. O'Brien, the right lung presented a large cavern, communicating with the right bronchial tube, in the lower extremity of which the extraneous body was impacted.

In one of the cases, that of Dr. Fogg, there was gangrene of the left lung, with firm pleuritic adhesions, and effusion into the pericardium. The patient expired on the thirty-second day, and the foreign body, a large prune-stone, was found impacted in the left bronchial tube.

Emphysema of the lungs was present in four of the cases. In

one of these, narrated by Lescure, death occurred at the end of sixty hours, having been preceded by a peculiar whistling noise in the larynx. The lungs were emphysematous in their entire extent, but there was no escape of air externally. The extraneous substance, a piece of apricot kernel, was found in the upper extremity of the trachea. In the case of Mr. Ormerod, the emphysema occupied a considerable portion of the left lung, the lower lobe of the right lung being hepatized and infiltrated with pus. The patient died on the nineteenth day from the lodgement of a pebble at the bifurcation of the trachea. In Dr. Carpenter's case, the left lung was emphysematous, and contained a number of small miliary tubercles. The man died thirteen years after the inhalation of four artificial teeth, the immediate cause of death being acute pleurisy. In my own case, in which a child, aged six months, perished on the thirty-third day, from the impaction of a grain of corn in the right bronchial tube, the corresponding lung was emphysematous, collapsed, inflamed, and adherent to the ribs.

Tubercles were present in two of the cases. In the one, narrated by Dupuytren, death occurred ten years after the introduction of a coin, which, on dissection, was found in the interior of a tubercular cavern. In the other case, observed by Dr. Carpenter, the deposits were in a crude state, and occupied the left lung, which, as before stated, was emphysematous.

Lesion of the larynx was found in two cases. In that observed by Mr. Allan Burns, the organ was inflamed and partially coated lymph, the foreign body being situated just below the larynx, and death occurring on the ninth day. In Mr. Bullock's case, the tube was almost completely obstructed by lymph, the mucous membrane was ulcerated, and the trachea was inflamed from one end to the other. The lungs were extensively diseased, and the right thoracic cavity contained upwards of a pint of serum, intermixed with plastic matter. The patient was six years old, and the foreign body, a quartz pebble, had been retained eight weeks.

Bronchitis was noticed twice, in both instances in connection with pneumonia. Pleuritic adhesions and effusions, either alone or combined, existed in nine of the cases. In a few of the cases there was disease of the bronchial lymphatic ganglions.

In addition to the above cases, the following, gleaned from various sources, may be mentioned. A man, attended by Dr. Jeffrey, of Glasgow, inhaled a large piece of *charcoal;* it nearly filled the

trachea, and destroyed life in three days. Dr. H. G. Jameson, of Baltimore, refers to the case of a boy, thirteen years of age, who perished from the introduction of a *bean*. After the first effects of the accident had passed off, he became so much relieved that he was unwilling to brook the confinement enjoined by his physicians. Determined to go out, he was in the act of putting on his coat, when he was seized with a violent cough, and instantly expired. Dr. Crawford, of Virginia, lost two sons in their infancy, in consequence of one of them having inhaled a *bean*, and the other a *persimmon-stone*. Dr. Williamson, of Baltimore, saw a patient perish, about four weeks after the accident, from the inflammation and debility produced by the presence of a *water-melon* seed in the windpipe.[1]

M. de la Romiguiere, member of the Royal Academy of Surgery, of Paris, attended a child who was suffocated by a *bean*, on the ninth day after its entrance into the trachea. The patient was so well after the accident that he played several times in the street.[2] Dr. John Browne,[3] of Dublin, saw a child, three years old, in whom a piece of *delft* had been forced into the right bronchial tube; the parents would not consent to an operation, and death occurred on the third day. Dr. Ruyer[4] relates the case of a child, who died in a fit of suffocation five months after the inhalation of a *bean;* the bean was swollen, and the lungs were disorganized by inflammation.

Dr. William Pepper, of Philadelphia, has kindly reported to me the case of a child, who died three years after having inhaled a grain of *coffee*. The prominent symptoms were hectic fever and embarrassment in the respiratory functions, caused by double pneumonia.

Gautier,[5] a French writer, gives the case of a man who lost his life from the introduction into his windpipe of a small *fish* which he had been holding in his mouth. In a moment of forgetfulness he allowed it to slip into the larynx, where it was arrested, with its tail projecting into the fauces. An attempt was made, soon after the accident, to seize and extract the fish with a pair of forceps, but the tail unfortunately broke off, and the man died suffocated.

[1] I am indebted for the above references to a short paper by Dr. H. G. Jameson, in the sixth volume of the American Medical Recorder.

[2] Louis's Second Memoir on Bronchotomy.

[3] Edinburgh Med. and Surg. Journ. vol. 35, p. 286, 1831.

[4] Hufeland's Biblioth. der Practische Heilkunde, B. lxx. p. 371, 1833.

[5] Journal de Médecine, Chirurgie, &c., Mai, Août, t. lxv. 1785.

Sir B. C. Brodie[1] mentions an instance, furnished him by the late Mr. Hodgson, of Birmingham, in which a boy, six years of age, lost his life from the ingress of the berry of a plant called the *bladder-senna*, of the size of a large pea. He died suddenly on the seventh day after the occurrence of the accident, and, on inspecting the parts, the substance was found in the trachea, about one inch below the cricoid cartilage. The same gentleman[2] refers to a case, observed by Mr. Phillips, Surgeon to the St. Mary-le-bone Infirmary, where a little girl, two years old, perished from having inhaled a portion of the claw of a *lobster*, which was firmly fixed in the trachea, a little above the level of the upper bone of the sternum. Professor Mussey,[3] of Cincinnati, is acquainted with an instance in which a child lost its life from the ring of a *watch-chain* becoming entangled in the larynx. Dr. Charles A. Lee,[4] of New York, saw a girl, ten years old, who was suffocated by a solid piece of *beef* blocking up the trachea, about midway between the larynx and the inferior extremity of the tube. She was seized with symptoms of suffocation while at dinner; an operation was proposed but peremptorily declined by the parents, and in ten minutes after respiration had entirely ceased.

A case is recorded by Roger Collard,[5] in which a *nail*, after having remained in one of the bronchial tubes between two and three years, at length caused death. There were no symptoms for a long time, but towards the end of the period here specified, the patient was seized with cough, expectoration, and fever, and died after an illness of a fortnight. The nail, partially oxidized, was found in the left bronchial tube; the lung was filled with softened tubercles, and the mucous membrane of the bronchial tube was thickened.

[1] Medico-Chir. Trans. of London, vol. xxvi. p. 293, 1843.

[2] Loc. cit.

[3] Trans. Amer. Med. Association, vol. iii. p. 363, 1850.

[4] Copland's Med. Dictionary, by Dr. Lee, vol. ii. p. 805. New York, 1846.

[5] Nouvelle Bibliothèque Médicale, t. i. Feb. 1826.

TABLE OF CASES OF DEATH WITHOUT OPERATION.

NO.	FOREIGN BODY.	SEX.	AGE.	SYMPTOMS.	SITUATION.	PERIOD OF DEATH.
1	Leech	Male		Ordinary, but very urgent.	Right ventricle of larynx	Soon
2	Bean			Lividity of the face, suffocative cough, and temporary aphonia.	Under glottis	Night after
3	Piece of ginger	Male	73 years	Severe cough for the first few hours; nothing diagnostic.	Right bronchia	41 hours
4	Apricot-kernel	Female	4 years	Peculiar whistling noise in the larynx; great dyspnœa, and difficulty of swallowing.	Upper part of trachea	60 hours
5	Bean	Female		Desire to lie on the back; whistling noise in breathing.	Larynx	9th day
6	Molar tooth	Male	29 years	Sense of distress in the chest, and feeling of weight in breathing.	Right bronchia.	11th day
7	Pebble	Female	4 years	Frequent and violent cough; variable; body changing its position.	Bifurcation of trachea	19th day
8	Prune-stone	Male	4 years	Cough, dyspnœa, and croupy voice; followed by pneumonia and hectic fever.	Left bronchial tube	32d day
9	Grain of corn	Female	6 mos.	At first slight, then more severe, and finally those of pneumonia.	Right bronchia	33d day
10	Bean		2½ years	Frequent and violent cough; cooing sound; and dulness on percussion on the left side of the sternum.	Trachea	6 wecks
11	Bone	Female	46 years	Pneumonia, violent cough, and urgent dyspnœa; fetid expectoration, and inability to lie down.	Third branch of bronchia	7 wecks
12	Pebble	Female	6 years	Symptoms of hooping-cough, and, latterly, of pneumonia.	Partly in larynx, and partly in trachea	8 weeks
13	Bone	Female	40 years	Cough aggravated by change of posture; hectic fever, and fetid breath.	Right bronchia	83 days
14	Bean		5 years	Ordinary; change of body shortly before death.	Right bronchia	5 months
15	Brass nail	Female	5 years	Symptoms of phthisis.	Right bronchia	1 year
16	Cockle-bur	Male	48 years	Urgent at first; then milder; then aggravated, and assuming the characteristics of phthisis.	Right bronchia	Nearly 13½ mos.
17	Cherry-stone	Male		Variable; finally those of laryngeal phthisis.	Left ventricle of the larynx	2 years
18	Bone	Male	22 years	Slight at first; afterwards fetid breath; expectoration; phthisis; hæmoptysis; gangrene of the lungs.	Right bronchia	4½ years
19	Louis d'or	Male		At first, extinction of voice; afterwards, inability to lie down; and, finally, phthisis.	Right bronchia	5½ years
20	Coin	Male	26 years	Symptoms of phthisis.	Lung	10 years
21	Four teeth	Male	35 years	Habitually asthmatic; symptoms masked; acute pleurisy a few days before death.	Right thoracic cavity	13 years

AND WITHOUT THE EXPULSION OF THE FOREIGN BODY.

CAUSE OF DEATH.	POST-MORTEM.	OBSERVER.	AUTHORITY.
Suffocation		Dr. Lacretelle	Gazette de Santé, Fevr., 1828.
Fit of coughing		M. Louis	Ephemerid. Acad. Nat. Curios., decad. iii. ann. vit. vi. obs. cclii.
Exhaustion	Pulmonary engorgement.	Dr. James Sheppard	London Lancet, 1845.
	Engorgement and emphysema of the lungs.	M. Lescure	Mém. de l'Acad. Roy. de Chir., v. 349, 1819.
Fit of coughing	Inflammation of the larynx.	Allan Burns	Surgical Anatomy of the Head and Neck, 410, Baltimore, 1823.
	Bronchitis, pneumonia, and pleurisy.	Dr. J. Houston	Dublin Journal Med. and Chem. Sciences, v. 42.
	Emphysema of the left lung, and hepatization of part of the right.	Mr. W. P. Ormerod	Clinical Collections and Observations in Surgery, 179, London, 1846.
Gradual exhaustion	Pneumonia; gangrene of the left lung; pleuritic adhesions.	Dr. J. S. H. Fogg	Boston Med. and Surg. Journ., xlvi. 501, 1852.
Exhaustion	Right lung collapsed, adherent, inflamed, and emphysematous.	Author	Author.
Fit of coughing	Pneumonia and bronchitis.	Dr. M. J. McCormack	London Lancet, i. 217, 1852.
Exhaustion	Hepatization and purulent infiltration of the right lung.	Mr. J. G. Forbes	Medico-Chirur. Trans. of London, xxxiii. 1, 1850.
Exhaustion	Ulceration and narrowing of the windpipe; serum in the right side of the chest, and engorgement, hepatization, and purulent infiltration of the lungs.	Mr. Henry Bullock	London Medical Gazette, xviii. 951.
Exhaustion	Large abscess in the right lung.	Dr. Peter Gilroy	Edin. Med. and Surg. Journ., xxxv. 293.
Suffocation	Two pounds of serum in the left side of chest; adhesions; left lung congested and hepatized.	Anonymous	Revue Médicale, and Johnson's Medico-Chir. Review, N. S., xviii. 535, New York, 1833.
Exhaustion	Right lung adherent, and containing several abscesses.	Dr. A. Brigham	American Journ. Med. Sciences, xviii. 46, 1836.
Exhaustion	Inflammation and abscess of the right lung.	Author	Author.
Exhaustion		P. J. Desault	Surgical Works, by Dr. Smith, i. 222, Phila. 1814.
Exhaustion	Right lung extensively adherent, and filled with abscesses; pleuritic effusions; enlargement of the bronchial ganglions.	Dr. J. Struthers	Dublin Med. Press, Nov. 24, 1852.
Exhaustion	Right lung nearly destroyed by suppuration, and right thoracic cavity filled with pus.	M. Lescure	Mém. de l'Acad. Roy. de Chir., v. 351, Paris, 1819.
Exhaustion	Lungs tuberculized, with a cavity containing the foreign body.	M. Dupuytren	Leçons Orales, iii. 584, Paris, 1833.
Acute pleurisy	Right lung collapsed and tubercular; pleuritic cavity filled with sero-purulent fluid; left lung emphysematous and tubercular.	Dr. W. G. Carpenter	Guy's Hospital Reports, vii. 353, London, 1842.

NARRATIVE OF CASES OF DEATH WITHOUT OPERATION, AND WITHOUT THE EXPULSION OF THE FOREIGN BODY.

Case 1.—*Leech; soldier; great dyspnœa; death from suffocation; foreign body in the ventricle of the larynx.* (Dr. Lacretelle, Gazette de Santé, 25 Fevrier, 1828; Lond. Lancet for 1828, vol. ii. p. 104.)

A soldier, soon after having drunk at a pool, suddenly felt a sense of suffocation. The surgeon of the regiment found him with a red and swollen face, the mouth being frothy, the eyes turned up, and the breathing almost entirely suspended. After this paroxysm he came to his senses, but soon relapsed. No symptoms of apoplexy were present; the only difficulty seemed to be an obstruction to the entrance and exit of the air. Whenever he attempted to answer any questions, a fresh paroxysm supervened, and he was obliged to desist. Believing that a foreign body was in the windpipe, laryngotomy was decided upon, but before the operation could be performed the man expired. On opening the body, a leech was discovered in the right ventricle of the larynx, from which it was detached with great difficulty. Its body, rather large, obstructed the glottis, and rendered the entrance of air, by this opening, almost impracticable.

Case 2.—*Bean; child; violent cough, threatening suffocation, and lividity of the countenance; aphonia; death the night after the accident; substance found under the glottis.* (Mons. Louis's Second Memoir on Bronchotomy; Ephem. Acad. Natur. Curios. Decad. iii. Ann. vet. vi. Obs. ccliii.)

On the 25th of September, 1723, a child at Dresden, playing with beans which he caught in his mouth, and again blew out, at length sent one into the windpipe. His countenance became immediately livid, and he was attacked with a violent cough, threatening suffocation. A surgeon being sent for, explored the œsophagus with a wire guarded with a small sponge, but nothing was brought up, except a small quantity of mucus. Notwithstanding this, the respiration became free, and the child, who had not spoken a word since the accident, recovered his speech. The following night he died instantly in a fit of coughing. The body being opened, the bean was at length found under the glottis, where it had evidently

excited fatal spasm. The probability is, judging from the history of the case, that it was originally arrested in the larynx, but that, upon the introduction of the sponge into the œsophagus, it was forced down into the trachea or one of the bronchial tubes, from which it was afterwards again driven up into the larynx, thus causing instant suffocation.

Case 3.—*Piece of ginger; man, aged seventy-three; violent cough for the first two hours; no diagnostic functional disturbance in the chest; rapid exhaustion; death at the end of forty-one hours; foreign body in the right bronchial tube.* (James Sheppard, M. D., London Lancet, 1845; Boston Med. and Surg. Journ. vol. xxxiii. p. 95.)

A man, aged seventy-three, subject for a long time to asthma, having retired with a piece of ginger in his mouth, found, on waking during the night, that it had slipped into the windpipe, where it produced violent cough, of a suffocative and spasmodic character. The cough continued without intermission for two hours, when it was followed by a calm and by short intervals of sleep. There was no pain in the chest, and no symptom to indicate the situation of the foreign body in the air-passages. Both sides sounded equally well, but there was little vesicular murmur anywhere; the left lung, almost immovable, was the seat of bronchial respiration, and the right of mucous crepitation, particularly distinct behind. The day after the accident there was a good deal of mucous expectoration, with some alteration of the voice, the result evidently of general debility rather than of laryngitis; on the second day great exhaustion ensued, and it became apparent that the patient could not last much longer. He complained of severe pain in the chest, especially between the shoulders, and, although perfectly sensible, was inclined to coma. He expired at five o'clock in the evening, about forty-one hours from the commencement of the cough and suffocative symptoms.

The lungs, dark and congested, were tied down by old adhesions; the larynx and trachea were sound, and the piece of ginger, contained in the upper part of the right bronchus, was soft and swollen, and emitted, when pressed, a bloody mucus. It was one inch and a quarter in length, and half an inch across its widest part. It is proper to add that the dissection was made two days after death.

Case 4.—*Piece of apricot kernel; girl, aged four years; peculiar whistling noise in the larynx; emetic; death at the end of sixty hours; foreign body in the upper part of the trachea; engorgement and emphysema of the lungs.* (M. Lescure, Mém. de l'Académie Royale de Chirurgie, t. v. p. 349.)

A little girl, aged four years, in eating an almond, allowed a piece to fall into the windpipe, where it instantly produced most violent cough and difficulty of respiration, threatening suffocation. The cough soon ceased, but the breathing continued laborious, and slight pain was felt in the throat. The air, in passing through the glottis, produced a loud whistling noise, and there was an alternate elevation and depression of the trachea, very sensible to the touch, especially during expiration. The voice, however, remained unchanged, and there had been no recurrence of the cough since the accident, several hours before M. Lescure was called in. The child passed a good night, and the only thing amiss in the morning was the peculiar whistling sound, which had never been absent; the pain in the throat had disappeared, and the child laughed, spoke, and ate, as usual. She was able to sit up and walk about, and was well all day, the only symptoms being the noise above mentioned. In the evening of this day, however, that is, twenty-four hours after the accident, the respiration became more laborious, the pulse was agitated, the deglutition was a little difficult, but not painful, and the elevation of the trachea was more conspicuous. The child passed a restless night. The next morning a grain of tartar emetic was given by the parents, but the vomiting only augmented the distress, and almost induced suffocation. An expectorant was administered during the day, which caused some discharge of mucus by the mouth, without any relief. On the contrary, the child in the evening breathed with the greatest difficulty; deglutition, even of the smallest quantity of fluid, was almost impossible; the pulse was small, feeble, and very frequent; and, finally, all the symptoms becoming worse, she expired about sixty hours after the accident. The voice had never changed, and the cough had never reappeared. A careful examination of the body having been made, the foreign substance, a little less than half an almond, was found in the windpipe, immediately below the cricoid cartilage. It was so small as to justify the belief that it might have easily moved up and down the tube. The lungs were much engorged at several points, and emphysematous in their entire extent, but the air had not shown

itself upon the external surface, as in the case observed by M. Louis, and narrated in his *Second Memoir on Bronchotomy.*

M. Lescure, in his comments upon this case, very justly remarks that an operation was the only remedy calculated to save the child; the foreign body, he thinks, might have been easily extracted, especially if it was impacted at the place where it was found; or, supposing, what is more probable, that it lay free within the tube, it might have been readily ejected by the air in respiration. It is proper to add, lest M. Lescure should be blamed, that he was not permitted to render the necessary succor, inasmuch as the case had passed into the hands of the Faculty of the L'Ecole Royale Militaire.

Case 5.—*Horse-bean; female child; desire to lie on the back; whistling noise in breathing; death on the ninth day; inflammation of the larynx; situation of the foreign body just below the rima of the glottis.* (Allan Burns, Surgical Anatomy of the Head and Neck, p. 410. Baltimore, 1828.)

A small horse-bean having accidentally dropped into the larynx of a young child, she was immediately seized with great difficulty of respiration, incessant cough, and general convulsions, which nearly ended her life. She continued in an insensible state for half an hour, during which she could not be observed to breathe. The respiration then became easy, and the face, previously inflated and dark-colored, began gradually to resume its usual complexion. For six hours she breathed with a whistling noise. Next day, the girl had another attack of difficulty of respiration, which, after a violent paroxysm of coughing, abated, but left her with a considerable fever. In this way she passed a week, during which she was bled and blistered on the chest. During all this time she was anxious to lie on her back. Finally, on the ninth day after the accident, she suddenly expired in a severe fit of coughing. The larynx was found inflamed and partially coated with lymph, the bean being situated just below the rima of the glottis.

From its history, it is reasonable to infer that this case did not occur in the practice of Mr. Burns; had this been so it would probably have had a much more fortunate termination; for this distinguished surgeon would, no doubt, have promptly resorted to tracheotomy, of which he professes himself a strong advocate in his writings.

Case 6.—*Patient's own molar tooth; man, aged twenty-nine; cough and pain in the windpipe; feeble respiratory murmur on the right side; bronchitis, pneumonia, and pleurisy; death on the eleventh day after the accident; foreign body in the right bronchial tube.* (Dr. John Houston, Dubl. Journ. Med. and Chem. Science, vol. v. p. 42, 1834.)

John Clare, aged 29, had occasion, in the month of May, 1830, to get the second molar tooth of the right upper jaw extracted. On the first application of the instrument, a fragment of the crown was chipped of, and removed from the mouth. By a second attempt the tooth was started from it socket; but on being disengaged from the claw of the instrument, it suddenly passed into the throat, and was not afterwards seen either by the patient or the operator. He felt immediately a momentary sharp pricking pain at the top of the windpipe, followed by a severe fit of coughing which soon went off, but recurred again several times without any evident cause, gradually diminishing in violence, and in a few hours ceasing to produce any annoyance. He continued, however, to complain of a feeling of undefinable uneasiness in the chest, a sensation of weight in breathing, and a tendency to draw heavy sighs, which haunted his mind, and kept him in a state of disquietude. He had no hoarseness, and no pain in any part of the chest.

Twenty-four hours after the accident, there was a mucous rattle in the lower part of the trachea, and perfect clearness of sound on percussion of the chest. The respiratory murmur, however, was more feeble in the right lung than in the left, and there was likewise under the right clavicle a sonorous râle, different from anything discoverable in any part of the left organ. These signs were fixed, and not influenced at all by change of posture, or a full, deep, inspiration or forcible expiration. In consequence of a disagreement on the part of the professional attendants as to the true character of the case, no operation was performed; the patient was treated antiphlogistically, and after having passed, successively, through the several stages of bronchitis, pneumonia, and pleurisy, first on the right side, and then on the left, he expired on the eleventh day after the attack.

It is not necessary to enter into the details of the dissection. Suffice it to say that the lungs and pleura exhibited all the evidences of intense inflammation. Upon slitting open the windpipe, which was highly inflamed throughout, the tooth was found lying in the right bronchial tube, about one inch beyond its commencement,

with the fangs directed downwards, and the broken surface of the crown upwards (Figs. 54, 55). It lay perfectly loose, and was

Fig. 54.

Fig. 55.

readily removed with the points of the scissors. The broken surface fitted accurately to that of the crown, as presented to Dr. Houston by the patient soon after the accident.

Case 7.—*Pebble; girl, four years of age; cough and difficulty of breathing; death on the nineteenth day; foreign body at the bifurcation of the trachea; emphysema of the left lung, and solidification of the lower lobe of the right.* (Mr. W. P. Ormerod, Clinical Collections and Observations in Surgery, p. 179, London, 1846.)

A robust little girl, four years of age, was admitted into St. Bartholomew's Hospital, laboring under the most violent fits of coughing, accompanied with great blueness of the skin, but no expectoration, except occasionally a few drops of blood. There was no fever, nor any general uneasiness. The mother stated that the child, three days ago, while playing in a field, had swallowed a stone, followed by a severe cough, which had recurred every day since in very violent paroxysms. The left lung admitted air everywhere without any unnatural sound, but the breathing was so loud as to indicate, by itself, a probability of stoppage to respiration in some other part. The right lung admitted air only in a small portion of the upper lobe; not the least murmur could be detected in the rest of its extent. A loud rhonchus was audible in the right bronchial tube, particularly distinct near the trachea. Percussion elicited a good and equal sound on both sides of the chest.

On the sixth day from the accident, the cough was very frequent, and the rhonchus was heard on both sides, but more loudly on the right. The quantity of air admitted into the right lung was now much increased. No particular change took place until

the ninth day, when the child was seized with acute bronchitis and inflammatory fever. A loud rhonchus was audible equally on the two sides in the large tubes, the air entering the vesicular structure of both lungs equally, but with a general sibilus. The chest was everywhere resonant on percussion. The peculiar cough and occasional paroxysms still continued. No remedies, except some leeches to the chest, were employed, owing to the obstinacy of the parent. The child became gradually more and more feeble, lost its sleep at night in consequence of the frequency of the cough, and sunk on the nineteenth day.

The left lung was emphysematous over a considerable portion of its external surface, from general dilatation of the air-cells. The lower lobe of the right lung was hepatized and infiltrated with pus; the remainder being rather œdematous. The bronchial tubes were filled with puriform mucus, and their lining membrane was preternaturally reddened. A pebble, of a rounded, oblong shape, and of the volume of a kidney bean, was found loose at the bifurcation of the trachea. The right cavities of the heart and the vessels connected with them, were distended with dark blood.

One of the most interesting facts connected with this case was the mobility of the pebble. On the third day, auscultation showed it to be in the right bronchia, but on the sixth air was admitted equally into both lungs, and the rhonchus was equally audible on both sides; circumstances clearly proving that both tubes were free. The pebble was evidently moved from its former situation, and could now only be in the trachea, the caliber of which it did not fit tightly, as the quantity of air passing into the lungs was considerable.

Case 8.—*Prune-stone; boy, aged nearly four years; cough, dyspnœa, and croupy voice, followed by pneumonia and purulent expectoration; death on the thirty-second day after the accident; gangrene of the left lung; extraneous body in the left bronchial tube.* (Dr. J. S. H. Fogg, Boston Med. and Surg. Journal, vol. xlvi. p. 501, 1852.)

Severe convulsive cough, great anxiety, threatened suffocation, and great embarrassment both in inspiration and expiration, with a croupy state of the voice, were the immediate consequences of the accident in this case. About ten hours after the attack, the symptoms were suddenly relieved while the child was swallowing a dose of castor-oil. During the next four days she was quite

comfortable, and disposed to play about the house. Bronchial irritation now came on, requiring the use of expectorants, and thus he continued, now better and now worse, for several weeks. There was no peculiar symptom denotive of the precise situation of the foreign body. Inspiration was comparatively easy and natural; but expiration was difficult throughout the disease. The cough was, for the most part, mild. It is worthy of notice that the croupy state of the voice disappeared at the end of the first ten hours after the accident; thus rendering it highly probable that the prune-stone was originally lodged in the larynx, and then descended into the passage below.

As the disease progressed, the suffering gradually increased, and the case finally assumed a hectic character. The dyspnœa was intense, the face and limbs were livid, the cough was violent, and large quantities of offensive pus were discharged from the lungs. Death occurred on the thirty-second day from the accident.

The left lung was bound down by extensive adhesions, and was gangrenous in its inferior lobe. From six to eight ounces of fetid pus escaped from the pulmonary tissues during the examination. The pericardium contained a large quantity of serum. The prune-stone, one inch in circumference and three-fourths of an inch in length, was found in the left bronchial tube, where it was so firmly impacted that there was scarcely space to pass a probe by the side of it.

Case 9.—*Grain of corn; female, aged six months; cough and dyspnœa; death at the end of the thirty-third day; foreign body in the right bronchial tube; pneumonia.* (Author.)

On Monday, July 19, 1852, I was requested by Michael Gartner, of this city, to visit his infant daughter, aged six months, on account of a great and sudden difficulty of breathing, threatening suffocation. On my arrival, I was informed that the child, an hour previously, while engaged with a girl, four years old, in playing with some corn on the floor, had been seized with a violent spasmodic cough, lasting nearly a quarter of an hour, and accompanied with great lividity of the features. The struggles for breath were described as having been of the most frightful character. The infant then became quiet, and before my arrival seemed disposed to sleep, without any inclination to cough. Some rhonchus was perceived in

both lungs, but it was more distinct on the right than on the left side.

At my visit the next morning, I learned that the child had passed a tranquil night, having had but one paroxysm of coughing since the previous evening. It was of the same nature as that which immediately succeeded the accident, but shorter and less severe. The following day, during the action of a dose of oil, the child voided a pellet of paper, such as is used for enveloping "sugar kisses," about the size of a dime, and with very sharp angles. From this period on the cough lost its suffocative character, although it frequently recurred, and the respiration continued to be more or less embarrassed. For the relief of these symptoms, I directed minute doses of antimony and squills, with an occasional aperient. The child nursed freely, and generally rested well at night, while in the day it seemed to be quite playful.

My visits were repeated almost every day; I was determined to watch every symptom, and to operate the moment I should become fully satisfied of the existence of a foreign substance in the air-passages. I examined the chest frequently, but such, generally, were the cries of the child that it was impossible to arrive at any definite conclusion respecting the condition of the lungs. Air seemed to enter both organs, and that nearly, if not quite, in the same quantity. For the reason I have just mentioned no satisfactory inference could be drawn from percussion. Gradually, however, the symptoms of pneumonia became more and more marked; the cough increased in frequency and violence, the appetite entirely failed, emaciation rapidly progressed, and the child died, completely exhausted, on the evening of the 21st of August.

With the aid of Dr. T. G. Richardson, and in the presence of my colleague, Professor Rogers, I examined the body the day after death. The right lung was collapsed, and adherent, at its superior lobe, by old bands, to the wall of the chest. The base of the inferior lobe was extensively attached by fresh, bloody lymph to the diaphragm and spine. The anterior edge of the upper lobe was emphysematous, several of the vesicles being quite large, and the whole lobe crackled under pressure and was filled with air. The lower part of the middle lobe was red, inflamed, and adherent to the inferior lobe, which was hepatized throughout. The left lung was sound in the greater portion of its extent. The larynx and trachea were natural. Half a grain of corn, three-quarters of an

inch long, and a quarter of an inch at its widest part, was impacted in the orifice of the right bronchial tube, which it closed almost entirely. It was considerably softened. The lining membrane, where it was in contact with the grain, was ulcerated and of a deep purple color. The canal below this point was obstructed with thick viscid mucus. The left bronchial tube was perfectly free. Several of the bronchial lymphatic ganglions were abnormally red and enlarged. The pleuræ and heart were sound.

Several circumstances conspired to prevent me from opening the trachea in the above case. The first was the decided opposition, in its early stage, of the parents to all operative interference; the second, the discharge from the bowels, about two days after the accident, of a pellet of paper, rendering it doubtful whether the presence of this substance at the top of the larynx might not have caused all the bad symptoms; and, lastly, the uncertain character of the illness after the first few days; none of the ordinary signs of a foreign body in the air-passages being discoverable by auscultation and percussion, owing to the struggles and cries of the little patient at every examination of the kind.

Case 10.—*Horse-bean; child, aged two years and a half; frequent and violent paroxysms of coughing; hectic fever; probable lodgement of the substance in the left bronchial tube; death at the end of six weeks.* (Dr. M. J. MacCormack, Lond. Lancet, vol. i. p. 217, 1852.)

A child, two years and a half of age, inspired a horse-bean, for the removal of which an emetic was used without benefit. Five weeks had elapsed when Dr. MacCormack saw it. The symptoms, at this period, were, frequent and violent paroxysms of coughing, emaciation and hectic fever, a peculiar whistling or cooing sound in the chest, and dulness on percussion on the left side of the sternum, a short distance below the clavicle. A similar noise was detected, opposite this space, on the posterior surface of the thorax. The respiration in the right lung was moist and puerile. A violent fit of coughing came on one morning, in which the child fell back in its mother's arms, became black in the face, and ceased to breathe. The bean was found impacted within the two upper rings of the trachea, where it had probably been thrown during the attack just mentioned, inasmuch as the physical signs previously observed tended to show that it had been lodged in the left bronchial tube; a conjecture still further confirmed by the roughness

visible on the mucous membrane of this tube. Both lungs were inflamed in the neighborhood of the former site of the foreign substance.

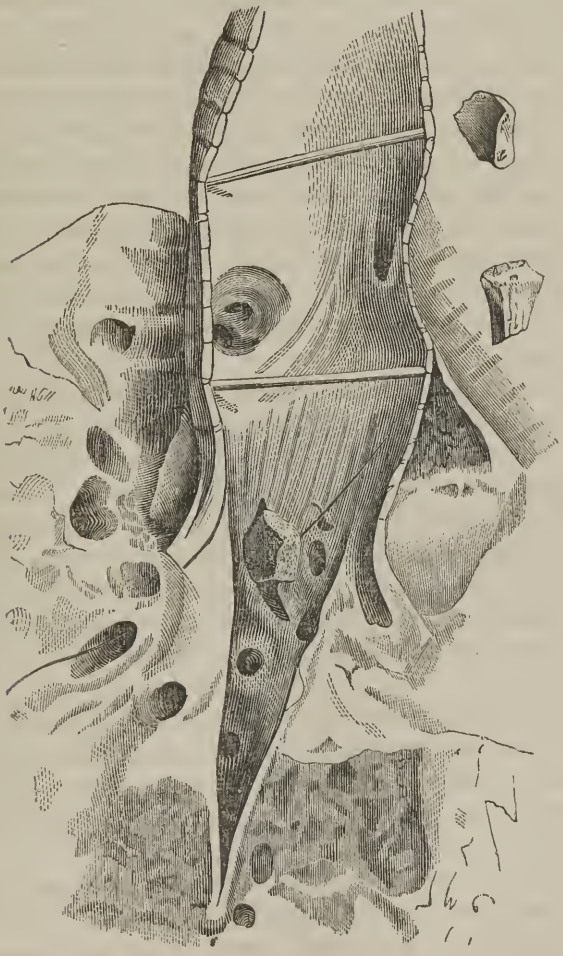
Case 11.—*Piece of bone; woman, aged forty-six; impaction of the foreign body in the orifice of the third branch of the right bronchia; pulmonary abscess; fetid expectoration; death at the end of seven weeks; hepatization and purulent infiltration of the lower two-thirds of the right lung.* (Mr. J. G. Forbes, Medico-Chirurg. Trans. of London, vol. xxxiii. p. 1, 1850.)

On the 10th of May 1849, a delicate female, forty-six years of age, swallowed a piece of bone out of some broth, and immediately discovered that it had passed into the windpipe. The day after the accident, on auscultating the chest, a marked difference was found to exist between the two sides. On the right, the respiratory sound was obscured, the natural vesicular murmur being scarcely perceptible, and a prolonged and peculiar rhonchus was heard throughout the lung, but most distinctly over the point to which the pain was referred, and was more audibly marked during expiration. On the left side the respiratory sound was feeble, but free from rhonchus, and both inspiration and expiration were lengthened. For three days she suffered severely, and on the 14th of May a consultation was held, at which it was decided not to operate, on the ground, first, that there was some doubt respecting the nature of the foreign substance, and secondly, that the physical signs did not seem to indicate any great amount of obstruction to the entrance of air into the lungs. It was argued, moreover, that if the extraneous body was of a gristly nature it might be softened and coughed up, or, at any rate, that it would cause less irritation and mischief than bone. Nevertheless, from this time forward, the case went on from bad to worse, the foreign substance producing serious lesion in the pulmonary tissues and great disturbance of the general health. The expectorated matter gradually assumed a purulent and dingy color; and on the 24th of June the patient coughed up two teacupsful of fetid pus.

During the latter part of her illness, the tongue and mouth became so sore that she was prevented, for some days, from taking medicine, or even nourishment. She could obtain no ease, except in the erect posture, in which she was supported with pillows. The violence of the cough and the offensive odor of the expectorated

matter, induced retching and vomiting, which added to her distress and exhaustion. She could scarcely get any sleep at night, and her restlessness, at times, was extreme. Her brain, however, remained unaffected, and her lips were free from lividity, though the face gradually assumed a waxy, death-like appearance. The chief auscultatory signs now were loud mucous râles, and dulness on percussion over the right side of the chest, with blowing respiration

Fig. 56.



at particular points. These râles were, however, less marked under the right clavicle, and the air appeared to enter with more

freedom into the upper part of the lung than elsewhere. The woman expired on the 5th of July, after having endured the most intense sufferings, from the violence of the cough and the urgent dyspnœa.

A small piece of bone (Fig. 56), weighing, when dried, three grains and a half, and measuring a quarter of an inch in length by three-eighths of an inch in breadth, was found firmly impacted in the orifice of the third branch of the right bronchial tube, at the distance of an inch and a half from the bifurcation of the trachea, and five inches and a half from the lower border of the thyroid gland. The position which it occupied readily explains the comparative freedom with which the air seemed to enter the upper part of the lung throughout the case, as evidenced by the auscultatory signs. The mucous membrane around the foreign body was of a vivid red color, and highly injected. The lower two-thirds of the right lung were of an ashy slate complexion, of dense consistence, very fetid, and infiltrated with purulent matter. The right carotid artery pursued an unusual course in the neck, passing in front of the trachea, and leaving a space of only one inch between it and the lower border of the thyroid gland.

It is not a little surprising that Mr. Forbes, who took charge of this case soon after the accident, and Mr. Arnott and others who met him in consultation four days subsequently, should have decided against an operation which was so plainly indicated, and which could alone afford any chance of relief. But it is still more surprising that a gentleman of Mr. Forbes's good sense, and of Mr. Arnott's known science, should have supposed that a piece of gristle, lodged in the air-passages, could become softened, although every one will admit that it might have been coughed up.

Case 12.—*Quartz pebble; girl, aged six years; foreign body retained eight weeks, partly in the larynx, and partly in the trachea; child supposed to have hooping-cough; death from inflammation of the lungs and air-passages in eight weeks.* (Mr. Henry Bullock, London Medical Gazette, vol. xviii. p. 951, 1836.)

On the 21st of May, 1836, a girl, aged six years, while playing with pebbles in her mouth, allowed one to pass into her windpipe. She was immediately seized with a most violent convulsive cough; so that she became black in the face, and was nearly suffocated; the paroxysm lasted half an hour, and then subsided. During the

next three or four days, the child merely complained of a sense of soreness in the throat, with nausea, occasional cough, and a copious mucous expectoration; she was also hoarse, but had no pain or difficulty in swallowing. Aperients and an emetic were prescribed, with some relief, but the child still persisted that the stone remained in the throat. At the end of the fifth day, she had marked symptoms of bronchial inflammation, the cough generally occurring in paroxysms six or seven times a day, with a copious expectoration of tenacious mucus, a loud mucous rattle at the upper part of the chest, increased hoarseness, and a kind of hooping inspiration. As the girl had never had pertussis, and as this disease was then prevalent among the children in the vicinity, her sufferings were ascribed to an attack of that complaint. Leeches and other remedies were employed, followed by so much relief that by the 20th of June she was quite well and strong. On the 6th of July, she was attacked with symptoms of pneumonia, which continued until the 18th of that month, when she expired. It is worthy of remark that, during the last four weeks of her illness, there was no return of the convulsive cough, nor any uneasiness about the throat. On

Fig. 57.

the day of her death, however, she again declared that she could feel the pebble, and in the same place as at first.

A quartz pebble (Fig. 57) was found, lying partly in the larynx,

and partly in the trachea, where it was retained by a layer of apparently organized lymph, of very considerable thickness. The mucous membrane beneath the lymph was in a state of ulceration, and the caliber of the tube was so nearly obstructed by the presence of this substance and the stone, as to render it difficult to pass an ordinary-sized probe downwards. The whole of the mucous membrane of the trachea was thickened and engorged with blood. The pebble was of the volume of a large horse-bean, smooth on the surface, and of an irregular figure. The right thoracic cavity contained upwards of a pint of turbid serum, intermixed with flakes of lymph. A false membrane existed on the lower part of the right pulmonary pleura, while nearly the whole of the substance of the right lung, and of the lower portion of the left, was much diseased, being in a state of engorgement, hepatization, and purulent infiltration. The bronchial tubes were loaded with mucopurulent matter, and the vessels of their lining membrane injected with blood. The bronchial glands were also enlarged, and some of them in a state of suppuration.

Case 13.—*Chicken-bone; woman, aged forty; violent cough and suffocation, followed by hectic fever and fetid expectoration; death in eighty-three days; body in the right bronchial tube; large abscess in the right lung.* (Dr. Peter Gilroy, Edinb. Med. and Surg. Journ. vol. xxxv. p. 293.)

A widow lady, aged forty, of a robust habit and excellent health, while eating her dinner on the 8th of Aug., 1826, was seized with a sudden and violent fit of coughing, threatening suffocation. On recovering, she stated that a chicken-bone had entered her windpipe, and was still in her chest. By this time, however, she breathed freely, and her alarm gradually passed off. The next day she complained of oppression in the chest, and had a slight tickling cough, with soreness at the top of the sternum, and general uneasiness. Being bled and purged, she felt so much relieved that, in a day or two, she was able to go some miles into the country; but the cough and other disagreeable symptoms continued, though in a less degree. At the end of a fortnight these symptoms increased, but were again mitigated by a repetition of the remedies. On the 13th of September, five weeks after the accident, there was a further aggravation of her distress; her countenance was anxious, the tongue coated, the pulse 96, and full; she complained of pain at the top of the

sternum, and whenever she raised herself the least, or turned on either side, a violent fit of coughing came on, which she could always excite at pleasure by change of posture. The breath exhaled an intolerable fetor, and suppuration occurred in the lungs, accompanied by hectic. She expired on the 29th of October, exhausted by pain, irritation, and discharge.

A large abscess, containing twenty ounces of pus, of a reddish-brown color, and very fetid odor, was found in the centre of the right lung, the greater part of which it occupied. The piece of chicken-bone, very light and porous, and weighing only six grains, lay in the upper portion of the right bronchial tube, close to the bifurcation of the trachea: the tube here communicated with the abscess.

Case 14.—*French bean; child, aged five years; violent cough, dyspnœa, and altered voice; death from suffocation five months after the accident; pleuro-pneumonia; foreign body in the right bronchial tube.* (Révue Médicale, and Johnson's Medico-Chirurg. Review, N. S., vol. xviii. p. 535, New York, 1833.)

A child, five years old, while romping, swallowed a French bean, the entrance of which into the windpipe was immediately followed by all the signs of suffocation, with a shrill, croaking state of the voice. After having suffered for two hours, the little patient became cheerful, and appeared to be quite well; but the distress in breathing returned, and continued, with various intermissions, for five months. At the end of this period the child was seized with a violent paroxysm of coughing and excessive dyspnœa, which had been brought on by leaping, and in a short time death occurred from suffocation.

On dissection, two pounds of serum were found in the left thoracic cavity, numerous adhesions existed between the left lung and the costal pleura, and the left lung itself was much congested, hepatized, and of a deep purple color. An inflammatory ring, six lines in diameter, was seen at the commencement of the left bronchial tube, caused, no doubt, by the lodgement of the bean during the period above specified; but the bean itself was found in the right tube, which it closed up, as it were, hermetically, and whither it was, in all probability, sent by the shaking of the body during the leaping which immediately preceded the suffocation.

Case 15.—*Brass nail; girl, aged five years; death in a little upwards of one year; abscesses in the right lung; foreign body in the right bronchial tube; violent cough, vomiting, hæmoptysis, and hectic irritation.* (Dr. Amariah Brigham, Amer. Journ. Med. Sciences, vol. xviii. p. 46, 1836.)

A girl, aged five, while playing at school, in May, 1823, was suddenly attacked with violent and convulsive coughing and vomiting, supposed to have been caused by swallowing some large substance. On recovering sufficiently to talk, she stated that she had a brass nail, such as is used in covering trunks, in her mouth at the moment of the seizure, but was unable to say whether it had passed down the throat or not. The cough continued severe for a few days, and then greatly subsided, thus allaying the apprehensions of her friends and physician, who supposed that the substance had descended the œsophagus. Nine months after the accident, when Dr. Brigham first saw her, she had some cough, but her health was tolerably good, and she was able to attend school. In May, 1824, one year from the time of the first symptoms, she took cold, which was speedily followed by an increase of cough, expectoration, and hæmoptysis. Hectic fever, night-sweats, and the usual symptoms witnessed in the last stage of pulmonary phthisis soon ensued. She expired on the 1st of June, 1824. The trachea and left lung were healthy; but the right bronchial tube was inflamed, and contained, more than an inch below the bifurcation of the passage, a common brass nail, half an inch long, with a head nearly six lines in diameter. It was of a black color, but not in the least corroded, and was firmly impacted in the canal. The right lung had contracted extensive adhesions, and contained several large abscesses communicating with the bronchial tube.

Case 16.—*Cockle-bur; man, aged forty-eight years; cough and dyspnœa, followed by inflammation and abscess of the right lung; death at the end of thirteen months and nearly a half; situation of the foreign body in the right bronchial tube; post mortem.* (Author.)

Early in the afternoon of the 10th of November, 1840, Mr. Robert S. Dougherty, aged about forty-eight years, a farmer of Trimble County, Kentucky, accidentally inhaled a cockle-bur, which he happened to have put between his front teeth as he was walking through one of his fields. Soon after, meeting with some hogs, he whistled for his dog, and while doing this the substance in question suddenly

slipped into his windpipe. For a few seconds he was nearly choked, was almost insensible, and coughed most violently. As soon as he had recovered himself a little, he hurried home, and ate a piece of hard bread and an apple, believing that the foreign substance was lodged in the œsophagus, and that it might thus be induced to pass into the stomach. He soon after took dinner, and continued quite easy until evening. Retiring early, he was not long in bed when violent coughing and dyspnœa set in, compelling him to rise and pace the room. Finding but little relief, and believing that the bur had descended into the windpipe, he determined to go to Bedford, a village three miles off, to consult Dr. O'Brien and Dr. Wright. He accordingly mounted his horse, and arrived there late at night. On the way he had a violent fit of coughing, but when he reached his physicians he was so comfortable that he was induced to go to bed, where he slept tolerably well till morning. Under the supposition that the substance had passed into the stomach, his attendants requested him to take a brisk cathartic, with a view to expel it by the bowels. He had at this time merely a little obstruction in breathing and a slight soreness in the neck and chest. To these symptoms was added a wheezing noise, especially when he took much exercise, and his cough continued to harass him somewhat at night.

On the 1st of December he took cold, which increased his cough and other distress, and compelled him to resort to expectorants. In January, he was seized with pain in the right side, accompanied with fever, and the ordinary symptoms of pneumonia. The attack was relieved by medicine and a blister, but the cough continued with nearly its former intensity. The patient, soon after this, began to expectorate large quantities of muco-purulent matter, of a highly offensive character. Whenever he had a severe paroxysm of coughing he could distinctly feel the bur moving up and down the trachea. In March, he took an emetic, hoping thereby to throw up the foreign body, but in vain.

I saw Mr. Dougherty for the first and only time early in April, 1841, in consultation with his regular attendants. I found him excessively emaciated, and laboring under hectic fever, accompanied with copious sweats, and the expectoration of from a pint to a quart of thick fetid pus every twenty-four hours. He had frequent paroxysms of coughing; and the application of the ear to the right side of the chest, just below the nipple, readily detected the existence of a pretty large cavern in the corresponding lung. Under

these circumstances I declined all surgical interference, and left him, satisfied that he would soon fall a victim to his sufferings. Contrary, however, to my own and the expectations of his friends, he lingered on until the 23d of December, thirteen months and thirteen days from the time of the accident. A week before he expired, he was suddenly seized with a violent pain in the head, which returned regularly every night, and was attended with delirium, leaving him free in the morning; he at length fell into a stupor, in which he continued to the period of his death. After I left him in April, little, if any, amelioration took place in his condition until the commencement of the warm weather, when he gradually began to improve in flesh and appetite, and was able to ride about through the neighborhood to visit his friends. The cough, however, steadily continued, and the matter which he ejected from his lungs retained its offensive smell, nor did it diminish any in quantity. His voice was always strong, and the respiration rather easy. His sleep was much interrupted by his cough. Early in November he took his bed, and seldom afterwards left it even to sit up for a short time.

On dissection, the bur, represented in the cut (Fig. 58), was found in the lower extremity of the right bronchial tube, in close proximity with a large cavern in the corresponding lung. It was unchanged in its appearance, but was incrusted with mucus and lymph, and was of remarkably large size, being upwards of three-quarters of an inch in length, and nearly one inch and a quarter in circumference. The tissues around the abscess were extensively hepatized, and the right lung was universally adherent to the wall of the chest and diaphragm. The left lung was entirely sound.

Fig. 58.

For an account of the *post-mortem* examination of this case, and for a history of the symptoms, both before and after my visit, I am indebted to my friend Dr. O'Brien, of Bedford, who saw Mr. Dougherty frequently from the time of the accident until he died.

Case 17.—*Cherry-stone; man; cough, difficulty of breathing, and inability to speak; lodgement of the substance in the left ventricle of the larynx; death at the end of two years from phthisis; discovery of the foreign body on dissection.* (P. J. Desault, Surgical works, translated by Dr. E. D. Smith, vol. i. p. 222, Philadelphia, 1814.)

A Provençal, breakfasting on cherries, got into a dispute with one of his friends; he grew warm and spoke loud, continuing to eat. Suddenly, he perceived that a kernel had passed into his glottis, where it immediately occasioned a convulsive cough, difficulty of breathing, and sharp pain. He was unable to speak, and the jugular veins were quite distended. After some hours the symptoms abated, and then recurred at different intervals, but less intensely. At length the patient became habituated to the extraneous substance, the presence of which was indicated merely by a sense of constriction on the left side of the larynx, on a level with the corresponding ventricle. In certain movements of the body, the kernel, escaping from the place where it was lodged, was carried against the glottis, where it produced cough, dyspnœa, pain, and a feeling of tightness. The symptoms, however, always soon disappeared, then recurred, and again ceased, thus inducing alternate ease and distress. In this condition the man consulted Desault, who advised laryngotomy, but which was opposed by some other surgeons, whose opinion had also been taken, on account of the danger of hemorrhage, the difficulty of dividing the thyroid cartilage, and the possibility of an aerial fistula after the operation. The man being thus left to his fate, died two years after the accident of laryngeal phthisis; and the opening of the body demonstrated the cherry-stone, situated in the left ventricle, to have been the cause of his death. Who can doubt that, had Desault's advice been adopted in this case, this poor man might have been saved? With a suitable instrument, whether introduced through the larynx or trachea, the foreign substance might have been easily dislodged, and pushed into the fauces.

Case 18.—*Piece of bone; man, aged twenty-two; violent cough and feeling of suffocation; retention in the air-passages four years and a half; frequent and copious hæmoptysis; gangrenous abscesses in the right lung; death; dissection; foreign body in the right bronchial tube.* (Dr. James Struthers, Dublin Medical Press, Nov. 24, 1852; Edinb. Monthly Journal, 1852.)

In October, 1844, Thomas Neal, a footman, aged twenty-two,

while eating part of a fowl, was suddenly seized, in the act of laughing, with a violent fit of coughing, and a feeling of suffocation; he became blue in the face, felt a sharp pain in the chest, and was sensible that some of his food had entered the windpipe. These symptoms subsided in about half an hour, and never returned. He vomited freely from an emetic, and could swallow both fluids and solids without difficulty. About an hour after the accident a tickling cough, accompanied with a wheezing in the throat, set in, and continued to trouble him occasionally, but gave him so little inconvenience that he pursued his usual business as if nothing had happened. He was, however, still convinced that there was something in his windpipe, the situation of which he referred to a spot a little to the right of the upper part of the sternum, saying that he felt it there.

About three months after the accident, the cough began to be accompanied by white frothy sputa, which, without any other change in the symptoms, gradually increased in quantity during the next twelve months. About six weeks after this he observed, for the first time, that the sputa were tinged with blood, and had a fetid odor. During the two following years the cough was more frequent, and the expectoration more profuse, as well as more red, and offensive. The fetor of the breath, in fact, became so marked, in 1848, that he was obliged to quit his situation, for which he was in every other respect fit. During the greater part of this year he had exacerbations of coughing every two or three weeks, attended, at times, with a considerable discharge of pure blood, amounting, occasionally, to as much as half a pint. In the beginning of November, 1848, he had all the symptoms of pneumonia. Early in the following month he entered the Royal Infirmary of Edinburgh; he was then pale, but by no means emaciated, and complained a good deal of cough, which recurred at frequent intervals, and was accompanied by profuse bloody and fetid expectoration. He slept well, had a good appetite, and the voice was unaffected. The left side was throughout resonant on percussion, with a puerile murmur, but without any râle. The opposite side was dull over the inferior three-fourths of its extent, both in front and behind, but particularly a little below the nipple. The vocal resonance was found throughout increased; a gurgling râle was heard about the middle of this side, posteriorly, over a space two inches square, and at several other points the respiratory

murmur was very harsh, and obscured by mucous and sibilant sounds. During the next three months there was but little change in his condition. For weeks at a time the sputa were free from blood; but once or twice a month they became tinged for several days, when the cough was also more frequent, and the matter more fetid and profuse. The urine during these paroxysms deposited large quantities of pink urate of ammonia, and contained numerous crystals of the oxalate of lime.

After a residence of three months, he left the Infirmary in the early part of February, 1849. For the next six weeks he enjoyed tolerable health, and was able to walk a considerable distance without inconvenience. His usual symptoms, however, continued; and in the month of March he was obliged to confine himself to the house. He gradually became worse; the breath and sputa had a gangrenous odor, the expectoration was very profuse, and there was great dyspnœa, with excessive weakness, and occasional feeling of suffocation. The right side was universally dull on percussion, and all natural respiratory sound was absent; the left side, on the contrary, was unusually resonant. He expired on the 29th of March, 1849.

The right bronchial tube, at its middle primary division, contained a small piece of bone, quite loose, clean, and of an irregularly elongated form, with several sharp spicula. The mucous membrane at that part was thickened, but quite free from ulceration and unnatural vascularity. The right lung was firmly and almost universally adherent, and contained numerous little cavities, varying in size from that of a hazel-nut to that of a pea. An abscess, about the volume of a small orange, and filled with a brown, dirty-looking fluid, of a cream-like consistence, was found in the apex of the organ. Another, but smaller one, existed at the middle of the lung posteriorly; it was lined by a dense, thick, false membrane, and opened directly into a bronchial tube, the size of a crowquill, at the other extremity of which the foreign body was discovered during the progress of the dissection. The left pleuritic sac contained from three to four ounces of serum; but the corresponding lung was healthy, except a small portion of the inferior border, which was hepatized, and studded with small, hard, grayish nodules, composed of altered epithelium, and granular fatty matter. The bronchial glands, especially those on the right side, were greatly enlarged, several being as big as a pigeon's egg. The heart and

abdominal viscera were sound. It is proper to add that Dr. Struthers did not see the patient until four years after the accident, when it was entirely too late for an operation.

Case 19.—*Louis d'or; man; absence of voice; inability to lie down; retention of the foreign body for five years and a half; death from pulmonary suppuration; discovery of the coin in the right bronchial tube; almost complete destruction of the corresponding lung.* (M. Lescure, Mém. de l'Académie Royale de Chirurgie, t. v. p. 351. Paris, 1819.)

An engraver of Paris, named Fabre, on the morning of the 5th of October, 1765, accidentally allowed a louis d'or, which he held between the thumb and forefinger of the right hand, to slip into the throat, from which it immediately descended into the windpipe. The most alarming symptoms of suffocation instantly supervened, but they lasted only a moment, and appeared to have been assuaged by a drink of cold water. For some days he experienced a little uneasiness in the fauces, attended with extinction of the voice. Four years after the occurrence of the accident, M. Lescure was requested to visit the patient in consultation with several surgeons and physicians. He was informed that he had had, at different times, paroxysms of suffocation, which had always seized him suddenly, and that he had never discharged the louis d'or, which the man said he actually felt in the trachea, near the cricoid cartilage, where he indicated its presence with his finger. He never could rest in bed without sitting up; the moment he attempted to lie down he was seized with suffocation, and it was on account of a very dangerous fit of this kind, a few days previously, that the consultation was summoned.

An examination of the trachea satisfied M. Lescure that this tube was unnaturally capacious. The difficulty of breathing had induced the belief that the patient was asthmatic, and under this impression various means had been used for his relief. Lescure, on the contrary, thought that all the symptoms were produced by the presence of the foreign body in the trachea, and that the only remedy was to open that tube and extract the coin, the existence and even the very site of which the man plainly designated. When it presented vertically, the respiration was quite free, because the two columns of air which passed by it were larger than the opening of the glottis; but the moment it changed its position, inclining horizontally, it acted like a valve, and obstructed the windpipe, thus

inducing suffocative symptoms. This appeared to be so clearly the case that Lescure did not anticipate opposition from any one. Much to his surprise, however, M. Petit, the physician, was the only one of the consultants who agreed with him in opinion. Some asserted that it was impossible that a foreign body, such as that mentioned, could remain so long in the air-passages, while others denied even the possibility of its introduction. Suffice it to say that Lescure was overruled, and that the man determined to follow the course which had been prescribed for his supposed asthmatic complaint.

His health gradually declining, Fabre retired into Normandy, where he died on the 3d of February, 1771, from disease of the lungs. The body was carefully examined by M. de la Hèche. The left lung was pretty sound, but the right was almost entirely destroyed by suppuration. The right cavity of the chest was filled with pus, and the Louis d'or was found, in a perpendicular position, at the superior part of the right lung, at the first bifurcation of the bronchia; it was easily passed through the glottis, and was perfectly natural, with the exception of a little discoloration at the centre of each side.

The nature and figure of the body had contributed not a little, M. Lescure thinks, to produce the accidents which destroyed the patient, tardy as they had been. Appearances seemed to indicate that it had been retained for several years near the larynx, at the superior part of the trachea, from which, had the tube been opened even at a late period, it might probably have been forced by the mere action of the air in respiration.

Case 20.—*Small coin; man, aged twenty-six years; body movable for five years, when it became fixed in one of the bronchial tubes; symptoms of phthisis; death at the end of ten years; coin discovered in a tubercular cavity.* (Baron Dupuytren, Leçons Orales, t. iii. p. 584, Paris, 1833.)

A man, aged twenty-six, of a robust constitution, playing with some children, amused himself by throwing a half-franc piece into the air, and catching it in his mouth. In one of these attempts the coin, during the act of inspiration, fell into the windpipe. The cough, and peculiar sound caused by its presence, sufficiently declared the nature of the accident. The foreign body sometimes remained fixed for several hours, during which the respiration was

regular; but occasionally it was impelled against the larynx, and then great pain was produced by the percussion of the parts. The patient, believing that the substance would ultimately be expelled spontaneously, refused to submit to an operation for his relief. This state of things continued for five years, when the coin, becoming impacted in the bronchial tube, caused but little uneasiness. The patient was now obliged to go to India, where symptoms of phthisis gradually declared themselves. Ten years after the accident he died, and, on dissection, the coin was found imbedded in a tubercular excavation in the lung.

Case 21.—*Piece of ivory, consisting of four artificial teeth; man, aged thirty-five; retention of the foreign body for thirteen years; patient asthmatic from childhood; no material increase of suffering after the accident; death from pleurisy, the effect apparently of the presence of the artificial teeth.* (Mr. W. G. Carpenter, Guy's Hospital Reports, vol. vii. p. 353, London, 1842.)

A man, aged thirty-five, an assistant in a chemical establishment in London, and an habitual asthmatic, swallowed, thirteen years ago, in a fit of coughing, a piece of ivory, wrought into four artificial teeth. The morning after the accident, he was advised to take an aperient, on the supposition that the foreign body had passed into the stomach; and, as there was no material increase of suffering, or inability to attend to his usual business, it was naturally concluded that the substance had been voided by the bowels. The circumstance was, therefore, gradually forgotten.

From the time when Mr. Carpenter first saw the patient, in the winter of 1841, until his death, a few months after, he was never free from fever. His pulse was always above one hundred, the skin was hot, and there were other symptoms of inflammation, which continued, without any intermission, until the following spring. On the 13th of April, he was seized with acute pleuritis in the right side, attended with excessive pain, distressing cough, and dulness on percussion on the anterior and posterior part of the chest, with absence of the respiratory murmur. To relieve these symptoms, blood was taken from the arm, and the bowels were moved with calomel, antimony, and colocynth. Subsequently, cups and blisters were employed, with various other remedies unnecessary to be specified. Death occurred on the 19th of April, about five days after Mr. Carpenter began his treatment.

On opening the right side of the chest, a very offensive gas gushed out. The cavity contained five pints of sero-purulent fluid; the lung was collapsed, and pressed flatly against the bodies of the vertebræ; and there were thick layers of lymph both on the pulmonary and costal portions of the pleura. On the outer surface of the lung was an old fistulous opening, large enough to admit the tip of the little finger, but not communicating with the bronchial tubes, or the interior of the organ, which contained a number of tubercles, some of them in a state of suppuration. The four artificial teeth, represented in the annexed sketch (Fig. 59), were acci-

Fig. 59.

dentally found, after the examination was completed, in the right thoracic cavity, in sponging out the blood, and replacing the lung. They were covered with a brownish crust, and furnished with silver rivets, by which they had been adapted to the upper jaw.

The left lung was emphysematous, and contained miliary tubercles. The corresponding pleura was healthy; but the smaller bronchial tubes were filled with mucus. The heart was sound.

Mr. Carpenter supposes—and the conjecture is very plausible—that the foreign body, in this case, gradually passed through the substance of the right lung by ulcerative action, and at length escaped into the right pleuritic sac, where its presence gave rise to the violent inflammation which immediately preceded dissolution. The fistulous opening, above alluded to, was, doubtless, the remains of the track pursued by the ivory. It is very remarkable, as observed by Mr. Carpenter, that the man never had any hæmoptysis.

CHAPTER XVI.

BRONCHOTOMY IN THE INFERIOR ANIMALS.

Tracheotomy has occasionally been performed upon the inferior animals, and it is to be regretted that the operation is not more frequently resorted to for their relief, as many, doubtless, perish that might thus be saved. In the subjoined case, which occurred in the hands of my friend, Dr. Kumpé, of La Grange, Alabama, the operation was crowned with the most gratifying result.

A valuable mare, the property of Mr. John McCain, in June, 1847, while eating sheaf-oats, became suddenly choked; her owner, having exhausted all his resources, sent the animal to Dr. Kumpé, and entreated his assistance. Twenty-four hours had elapsed since the occurrence of the accident. The animal was evidently in great distress; she labored under excessive dyspnœa, her head and neck were extended, she refused food and drink, and her breathing was audible at a distance of six or seven yards. On applying the ear to the windpipe, it was obvious that the obstruction was either in the larynx or in the upper portion of the trachea. Dr. Kumpé having provided himself with a strong scalpel, a sharp-pointed bistoury, and other instruments, together with a long probang, the animal was thrown upon her left side, and firmly secured, the head and neck being held in the extended position. The hair being shaved off in front of the windpipe, an incision, three inches in length, and commencing about an inch and a half below the cricoid cartilage, was made through the integuments along the median line, thus exposing the muscles in that situation, which were next separated from each other in the usual manner. Five of the rings of the trachea were then divided with the bistoury, when the probang was introduced into the opening, and carried gently upwards through the larynx into the fauces. This proceeding had the effect of dislodging the foreign body, and of thrusting it into the

mouth, from which it was afterwards withdrawn with the hand. It proved to be a head of oats, at least three inches and a half in length, and proportionably thick.

Not more than five or six ounces of blood were lost during the operation, and, as no vessels of any importance were divided, not a single ligature was required. After the oozing had ceased, the edges of the wound were approximated by five interrupted sutures, when the mare was released, and soon commenced eating grass. A slippery elm poultice was constantly kept upon the wound for some days, for the twofold purpose of moderating inflammatory action, and preventing the attacks of flies. An active saline cathartic was given soon after the operation, and the most rigid diet enjoined. The wound healed very kindly, and sixteen days after the operation the mare was again in the harness.

In a recent paper on tracheotomy by Professor Eve, of Nashville, is a brief account of a case of foreign body in a horse, terminating fatally from the effects of pneumonia. The animal, while eating by the way-side, was suddenly seized with a violent fit of coughing, which continued, at irregular intervals, for a month or two, when he died. An examination being made, a portion of an oak leaf was found in one of the lungs, along with an abundance of purulent matter.

CHAPTER XVII.

GENERAL SUMMARY.

From the numerous facts and cases adduced in the preceding pages, and from the reasoning founded upon them, the following conclusions may be fairly and legitimately deduced. These conclusions may be arranged under different heads, according to their respective relations, as diagnostic, pathological, therapeutic and operative.

I. *Diagnostic Signs.*—Under this division of the subject may be briefly mentioned the nature and mode of entrance of foreign bodies, their liability to be arrested in different portions of the air-passages, and the symptoms commonly induced by their presence.

1. Any substance, whatever may be its form, provided it be not disproportionably large, may enter the larynx, and thence descend into the trachea and bronchial tubes.

2. The entrance of the foreign body is usually effected during a strong and sudden inspiration, while the epiglottis is off its guard, the glottis expanded, and the larynx quiescent.

3. The extraneous substance may be arrested in any portion of the air-passages, but not with equal frequency. Thus, in the larynx, it is, perhaps, most liable to be entrapped in the ventricles of Morgagni; and, when it descends into the bronchial tubes, it more frequently selects the right than the left. The trachea, on the contrary, rarely becomes its permanent receptacle; and the same is true in respect to the binary and tertiary divisions of the bronchial tubes.

4. The site of the foreign body is materially influenced, not generally, but frequently, by its size, weight, and configuration. Thus, a shot, ball, pea, bead, or pebble will be more likely to descend into the bronchial tubes than a rough, light, sharp, or angular substance.

5. The intruder may shift its place. Thus, it may pass from one bronchial tube into the other, or from these canals into the trachea,

or from the trachea into the larynx, in a direction contrary to that of its entrance. On the other hand, it may be firmly impacted, either in its first situation, or in some secondary one.

6. The immediate and invariable effect of the entrance of a foreign body into the air-passages is a violent, spasmodic, and irresistible cough, with dyspnœa, and a sense of impending suffocation. The countenance is frequently livid, and the patient sometimes falls down in a state of insensibility.

7. The violence of the first symptoms continues from a few minutes to a quarter of an hour, half an hour, or even longer, when it is succeeded by a calm, variable in duration, and again followed by cough and difficulty of breathing, very much as in the first instance.

8. When the extraneous substance is arrested in the larynx, there will generally be more or less change in the voice, sometimes, indeed, total aphonia, hoarseness, and croupy cough, with diminished respiratory murmur in both lungs. The latter symptom will be most conspicuous when the body is so large as to impede materially the ingress of the air.

9. When the foreign body plays up and down the windpipe, as it often does when it is light and small, it always excites violent coughing and suffocative symptoms, very similar to those produced at the moment of its entrance. Under such circumstances, the patient can frequently feel the extraneous substance as it impinges against the trachea and the larynx. It is not so certain, however, as some have alleged, that the surgeon can hear and feel it by the application of the ear and fingers to the windpipe. Such an occurrence, at all events, must be very unfrequent.

10. A bulky body, relatively considered, may entirely fill the bronchial tube into which it may happen to fall, and thus give rise to complete collapse of the corresponding lung, as occurred in one of my own cases. A thin, flat body, as a coin, may produce the same effect, by acting as a sort of valve. In general, however, more or less air will pass by the side of it, thereby enabling the respiration to go on, although much more feebly than in the normal state. In both cases, the walls of the chest, on percussion, will emit a clear sound. The respiration in the opposite lung, after the first few days, will generally be puerile.

11. The site of the foreign body is occasionally, but not generally, indicated by a fixed pain, soreness, or sense of uneasiness in the larynx, trachea, or bronchial tubes.

12. The expectoration may be simply mucous, or it may be tinged with blood, or mixed with pus, especially in chronic cases, in which there is also occasionally hæmoptysis.

13. In attempting to establish the diagnosis of a foreign body in the air-passages, the practitioner must take into account, first, the history of the case; secondly, he must carefully examine the condition of the respiratory organs, considering fully the rational and physical signs; and, thirdly, he must bear in mind the fact that the foreign body is liable to change its situation, thereby inducing corresponding alterations in the symptoms.

II. *Pathological Effects.*—These effects are primary and secondary; the former relating to what takes place immediately after the occurrence of the accident, and the latter to the organic alterations induced in the respiratory apparatus in consequence of the protracted retention of the foreign body.

1. The extraneous substance may destroy life at the moment of its introduction, or death may be induced at a variable period afterwards. In either case, the fatal effect may be produced by spasm of the larynx, or by mere mechanical occlusion.

2. The foreign body may be expelled immediately after its entrance, in a violent paroxysm of coughing, or it may be expelled subsequently either before or after it has induced serious structural lesion in the air-passages.

3. No patient is safe so long as the extraneous substance remains in the windpipe, whether in the laryngeal, tracheal, or bronchial portion, inasmuch as he may perish at any moment from suffocation, or, at a more or less remote period, from inflammation.

4. The danger from suffocation, when the patient escapes from the first effects of the accident, is generally greatest, all other things being equal, when the foreign body plays up and down the windpipe. If impacted, it may lead to the same result by becoming accidentally detached; but in such a case it will be more likely to destroy life through inflammatory action.

5. A foreign substance is occasionally comparatively harmless, as when, for example, it lies in one of the ventricles of the larynx; but, generally, it causes serious structural mischief.

6. The danger of severe and fatal inflammation is greater when the substance is lodged in the bronchial tubes than when it is arrested in the larynx or the trachea.

7. Violent and even destructive disease may be induced in the

lungs, bronchial tubes, and pleura when the foreign body is situated in the larynx.

8. The most common structural lesion in cases in which the extraneous substance is retained for any length of time, are inflammation, abscess, and tubercles of the lungs, inflammation of the mucous membrane of the windpipe, and inflammation of the pleura, with effusion of serum and lymph, or sero-purulent matter. In rare instances there is marked alteration in the conformation of the chest, as happened in one of my own patients.

III. *Therapeutic and Operative Considerations.*—Under this head may be mentioned, aphoristically, the use of emetics, sternutatories, and other remedies, as expellents of foreign bodies; the importance of early recourse to bronchotomy, with the manner of performing the operation; and the various circumstances which should regulate the after-treatment.

1. Although foreign bodies have occasionally been ejected from the windpipe, under the influence of emetics, errhines, and other means, the number of such cases is too small to justify the practitioner, under any circumstances, in confiding in these different classes of remedies. Generally, indeed, their effect is to increase the respiratory suffering and the danger of the patient, by impelling the intruder against the larynx, where its presence always excites spasm and other unpleasant symptoms.

2. The remarks just made in reference to the use of emetics, sternutatories, and other means, are equally applicable to all spontaneous efforts at expulsion, whether they occur in the form of coughing, violent respiratory action, sneezing, vomiting, or dreaming; because, although these efforts are sometimes successful, yet they are more generally unavailing, if not positively hurtful, and even destructive to the patient.

3. Inversion and succussion of the body, with or without beating of the chest, are generally hazardous proceedings, unless preceded by an opening in the windpipe; for the reason that the offending substance, if it be forced out of its lurking place into the larynx, or even against this portion of the tube, is inevitably followed by violent coughing and suffocative symptoms; thus greatly endangering the safety of the patient. The only case in which they ought to be practised, is where the foreign body is a shot, bullet, or similar substance.

4. Inasmuch, then, as no confidence is to be placed in the use of

emetics, errhines, and other means, inversion and succussion of the body, and not even in nature's own efforts; and inasmuch, moreover, as no patient can be considered as being safe so long as the extraneous substance remains in the air-passages, it follows, as a necessary corollary, that bronchotomy affords the best chance of relief, and that, consequently, it should always be resorted to as early as possible, unless there is some special contraindication; as, for example, serious organic disease of the respiratory organs. The great danger in this accident is spasm of the glottis, which nearly always promptly disappears the moment the artificial opening has been effected.

5. In children, and in young or timid persons, the operation should always be preceded and accompanied by the administration of chloroform, which, while it perfectly calms the patient, greatly facilitates the extrusion of the foreign body, by rendering the respiratory organs tranquil and passive.

6. Laryngotomy is always comparatively easy of execution, and should, therefore, always be selected when there is a positive certainty that the intruder is lodged in the larynx. In all other cases, and also where the patient is very young and the neck very short, tracheotomy, although, in general, a very difficult procedure, should be preferred. Laryngo-tracheotomy is rarely necessary or proper, except in cases where the ordinary operations are found to be inadequate.

7. The windpipe, as a general rule, should never be opened before there is a cessation of hemorrhage, lest the blood, by falling into the tube, should embarrass the operator, if not seriously compromise the safety of the patient.

8. The opening, both in laryngotomy and in tracheotomy, but especially the latter, is generally too small to admit of the ready escape of the offending substance. To answer the purpose effectually, and this is one of the great objects of the operation, it should be at least one inch and a quarter in the adult, and not less than one inch in the child.

9. There is no necessity, in any case, for the removal of an elliptical portion of the trachea, inasmuch as the retraction of the edges of the wound by means of hooks will generally afford ample space for the ejection of the foreign body and the introduction of instruments. In laryngotomy, a crucial incision may sometimes be advantageously made into the crico-thyroid membrane.

10. Under no circumstances should bronchotomy be performed without a thorough exploration of the chest and œsophagus. It should be remembered that mere spasm of the glottis, caused by the lodgement of a foreign body in the fauces or gullet, or by derangement of the digestive, respiratory, and nervous functions, may induce a train of phenomena, closely resembling those occasioned by the presence of a foreign body in the air-tubes.

11. Bronchotomy is generally inadmissible when there is serious organic disease of the lungs, attended with marasmus and all the ordinary symptoms of pulmonary phthisis.

12. The foreign body, both in laryngotomy and tracheotomy, may escape either at the artificial opening, or by the glottis. In either case, it may be thrown to a considerable distance, perhaps the very moment the tube is pierced; or it may be intercepted by the edges of the wound; or it may, if it take the natural route, lodge in the mouth, or pass into the stomach.

13. Should the foreign substance not be ejected, or appear at the artificial orifice within a few minutes after the tube has been pierced, search should be made for it with the forceps, or hook, with a view to its extraction; but all such attempts should be made in the most gentle manner, nor should they be prolonged beyond a few seconds at a time; inasmuch as they almost invariably excite violent coughing and suffocative feelings. The use of chloroform will greatly facilitate this step of the procedure.

14. A much better plan than searching for the foreign substance, at least in the first instance, is to invert the patient's body, and to strike the chest with the hand, or with a pillow. This procedure should be tried in all cases of balls, shot, peas, beans, water-melon seeds, plum-stones, cherry-stones, button-moulds, and other similar articles. Inversion of the body, with previous opening of the tube, is a comparatively safe operation. Succussion and percussion are important auxiliaries in such a case.

15. When the extraneous body refuses to escape, or resists our efforts at removal, the edges of the tracheal wound should be kept apart by means of blunt hooks, in order to favor extrusion. The outer wound should be covered, in this case, with a piece of gauze, arranged in the form of a bag, to prevent the ingress of flies and dirt.

16. Riddance having been effected, the wound is closed with adhesive strips, aided, if necessary, by a few interrupted sutures,

care being taken not to carry them through the substance of the trachea. Simple water-dressing is the best application, but even this may, in general, be dispensed with.

17. The after-treatment must be strictly antiphlogistic; the respiratory organs must be diligently watched; and the air of the patient's apartment must be maintained, throughout, at a uniform temperature, that is, at from 65° to 68° of Fahrenheit. It should be remembered that no patient is safe, or out of danger, after this accident, so long as there is inflammation of the respiratory organs, whether the intruder has been expelled or not.

18. Finally, it may be necessary to perform bronchotomy a second or even a third time. The same circumstances which induce us to perform it once may compel us to perform it again, at a more or less remote period, upon the same individual.

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